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C&SF Comprehensive Review Study – Alternative A

Component A6

Geographic Region: North of Lake Okeechobee

Component Title: Storage Reservoir – SEE COMPONENT FIGURE 1

Purpose: To increase the capacity of the hydrologic system to better meet the water management objectives associated with flood protection, water supply and environmental enhancement. The additional water storage capacity allows for greater detention of water during wet periods for subsequent use during dry periods. It is also anticipated that this increased storage capacity will shorten the duration and frequency of both high water levels in the Lake that are stressful to the Lake littoral ecosystems, and large discharges from the Lake that are disruptive to the downstream estuary ecosystems.

Operation: Water from Lake Okeechobee is to be pumped into the north storage reservoir when the climate-based inflow forecast projects that the Lake water level will rise significantly above those levels that are desirable for the Lake littoral zone (14.35 feet - 14.75 feet NGVD; Figure 1). During the dry season, flows will be allowed back to the Lake from the reservoir when the Lake level is projected to fall to within three-quarters of a foot of the supply-side management line in the same dry season, or below 11.75 feet NGVD in the upcoming wet season. During the wet season, flow is allowed from the reservoir to the Lake when climate-based inflow forecast projects less than 1.5 million acre-feet of inflow during the next 6 months and the Lake water level is either currently below 11.75 feet NGVD or projected to be in supply-side management during the upcoming dry season.

Design:

20,000 acres at 10 feet maximum depth

Inflow pump capacity = 4800 cfs

Outflow structure = 4800 cfs

Location: To Be Determined – Specific site not necessary for Water Management Model simulation
Counties: Glades, Highlands, Okeechobee, Osceola, and Polk

Assumptions and related considerations:

- 1) Uncertainty in land availability.
- 2) An alternative to capturing Lake water would be to attenuate flood waters before reaching the Lake. This could be done north of the Kissimmee River which could have positive impacts to the Kissimmee River Restoration Project or within the

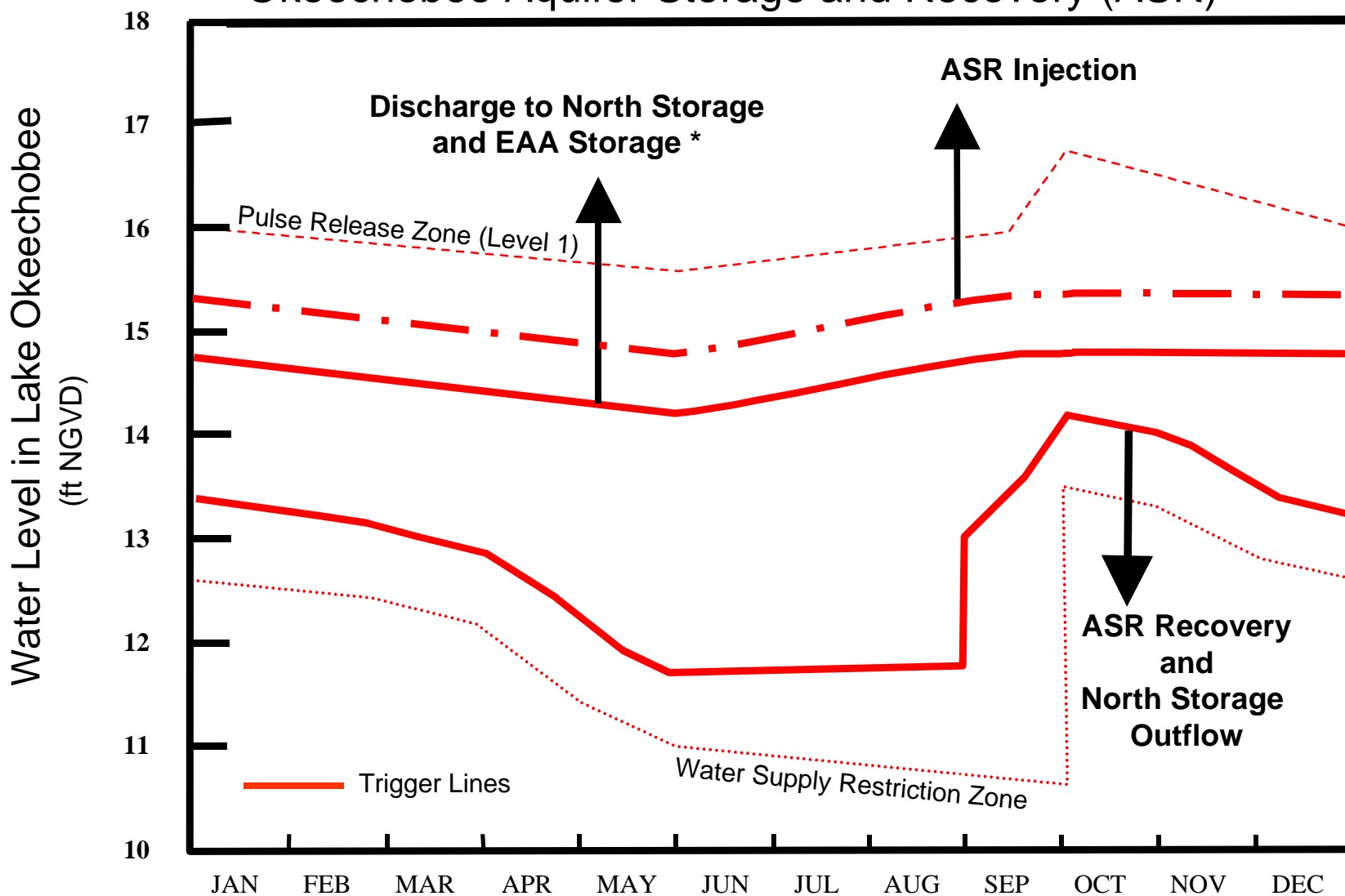
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Taylor Creek/Nubbin Slough which would improve water quality entering the lake.

- 3) Potential increase in stage duration of Lake Okeechobee.
- 4) Potential decrease in maximum stages of Lake Okeechobee.

Figure 1. Trigger Lines for North of Lake Okeechobee Storage and Lake Okeechobee Aquifer Storage and Recovery (ASR)



* Discharge to North and EAA Storage if Lake Okeechobee stage is forecasted to be above "Discharge to ...Storage" line, or if stage is above Pulse Release Zone (level 1) line.

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Component B2

Geographic Region: St. Lucie/C-44 Basin

Component Title: Storage Reservoir

Purpose: Storage reservoir to capture local runoff from C-44. The reservoir will be designed for flood flow attenuation to the estuary, water supply benefits including environmental water supply deliveries to the estuary, and water quality benefits to reduce salinity and nutrient impacts of runoff to the estuary.

Operation:

Inflows from C-44 basin runoff only when Lake stage is > 14.5 feet NGVD and no environmental water supply deliveries to the St. Lucie Estuary are needed.

Design:

10,000 acres at 4 feet maximum depth

Inflow pump capacity = TBD (initially assumed to not constrain performance)

Outflow structure capacity = TBD (initially assumed to not constrain performance)

Location: To be determined – Specific site not necessary for Water
Management Model simulation
Counties: Martin

Assumptions and related considerations:

- 1) Uncertainty in land availability.
- 2) Potential water quality benefits by reducing nutrient loading to the estuary.

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Component C6

Geographic Region: St. Lucie/C-44 Basin

Component Title: Environmental Water Supply Deliveries to St. Lucie Estuary

Purpose: To provide freshwater deliveries to the St. Lucie Estuary to protect and restore more natural estuarine conditions. For Alternative D the time series of estuary target flows was revised from the series used in Alternatives 1, 2, 3, 4 and 5. The target estuarine time series was revised because, under current policy, the C-44 basin does not discharge water to the St. Lucie estuary when Lake Okeechobee is below 14.5 feet NGVD and also because such discharges are generally undesirable from an estuarine management viewpoint. The time series used in the earlier alternatives did not reflect these considerations.

Operation: Deliver (revised) desired estuary target discharge through S-80 from the reservoir when water is available or from the Lake when the Lake stage exceeds 11.5 feet NGVD.

Design: Operational change only.

Location: C-44 and St. Lucie Estuary
Counties: Martin and St. Lucie

Assumptions and related considerations:

- 1) Estuary deliveries are based on maintaining salinity conditions in the estuary to support a range of aquatic vegetation seagrass, invertebrates, and fish communities.

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Component D5

Geographic Region: Caloosahatchee/C-43 Basin

Component Title: Storage Reservoir(s) with Aquifer Storage and Recovery (ASR)

Purpose: Storage reservoir(s) with ASR to capture basin runoff and releases from Lake Okeechobee. These facilities will be designed for water supply benefits, some flood attenuation, and to provide environmental water supply deliveries to the Caloosahatchee estuary.

Operation: Excess runoff from the C-43 basin and Lake Okeechobee flood control discharges will be captured by the proposed C-43 reservoir(s). Water from the reservoir(s) will be used to provide environmental deliveries to the Caloosahatchee Estuary, to meet demands in the Caloosahatchee basin and to inject water into the ASR wellfield for long-term (multi-season) storage. Water from the ASR facilities will be used to meet environmental demand of the estuary and meet basin demands. Any estuarine demands not met by basin runoff, the reservoir and the ASR system will be met by Lake Okeechobee, as long as Lake stage is above 11.5 feet NGVD. Lake water is also used to meet the remaining basin demands subject to supply-side management.

The C-43 reservoir is operated in conjunction with Component DDD5, the Caloosahatchee Backpumping Facility which includes an STA for water quality treatment. If the levels of water in the reservoir exceed 6.5 feet and Lake Okeechobee is below the pulse release zone (see Figure 1), then water is released and sent to the backpumping/treatment facility at 2000 cfs.

Design:

Reservoir(s) total of 20,000 acres at 8 feet maximum depth.
ASR wellfields total of 44, 5-MGD wells

Reservoir(s) Inflow pump capacity = TBD (assumed not to constrain performance).

ASR inflow capacity = limited to 220 MGD.

Reservoir(s) outflow structure capacity = TBD (assumed not to constrain performance).

ASR outflow capacity = limited to 220 MGD.

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Location: TBD - Specific site not necessary for simulations

Counties: Hendry, Glades, and Lee

Assumptions and related considerations:

- 1) Uncertainty in land availability.
- 2) Potential water quality benefits by reducing nutrient loadings.
- 3) Raw water ASR injection permittable.
- 4) 70 percent recovery for injected ASR water.
- 5) Size of injection bubble not limited.
- 6) ASR facility sized to slightly exceed minimum flows to estuary.

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Component E5

Geographic Region: Caloosahatchee/C-43 Basin

Component Title: Environmental Water Supply Deliveries to Caloosahatchee Estuary

Purpose: To provide freshwater deliveries to the Caloosahatchee Estuary to establish desirable salinity regimes at locations of key estuarine biota.

Operation: Deliver (revised) desired estuary target flow through S-79 in priority order, from basin runoff, from the C-43 storage reservoir, from the C-43 basin ASR system and from the Lake when the Lake stage exceeds 11.5 feet NGVD.

Design: Operational change only. For Alternative 5 the time series of estuary target flows was revised from the series used in Alternatives 1, 2, 3 and 4. The revised series changes the timing and total amounts in a way that assures that desirable salinity patterns will be achieved and at the same time makes some water available for capture and utilization in the regional system. The capture of the excess runoff is accomplished in Alternative 5 by the Caloosahatchee Basin Reservoir and ASR system (component D5) and by a new component, Caloosahatchee Backpumping with Stormwater Treatment Area (component DDD5).

Location: C-43 and Caloosahatchee Estuary

Assumptions and related considerations:

- 1) Estuary deliveries are made to maintain salinity conditions in the estuary that support a range of aquatic vegetation, seagrass, invertebrates and fish communities.

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Component F3

Geographic Region: Lake Okeechobee

Component Title: Lake Okeechobee Regulation Schedule

Purpose: Operating criteria for Lake Okeechobee that includes flood control, water supply (including releases to the Water Conservation Areas to meet estimated natural system needs), and Lake littoral zone and estuary protection.

Operation: Use current regulation schedule with the design modifications made in Components A and GG and with the exception of eliminating all St. Lucie and Caloosahatchee regulatory discharges (except emergency releases - Zone A, from Run 25).

Design: Operational change only. Modify the regulation schedule by eliminating all but emergency discharges to both the St. Lucie and Caloosahatchee Estuaries.

Location: Within existing boundary of Lake Okeechobee
Counties: Glades, Hendry, Martin, Okeechobee and Palm Beach

Assumptions and related considerations:

- 1) It is assumed that the implementation of other project components will reduce the frequency of high Lake stage events therefore reducing the need for regulatory releases to the St. Lucie and Caloosahatchee Estuaries.

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Component G3

Geographic Region: Everglades Agricultural Area (EAA)

Component Title: Storage Reservoir (division of the reservoir into 1-20,000-acre compartment for supplying EAA irrigation demands and 1-40,000-acre compartment for supplying environmental demands)

Purpose: Storage reservoir to: improve timing of environmental deliveries to the Water Conservation Areas including reducing damaging flood releases from the EAA to the Water Conservation Areas; reduce Lake Okeechobee regulatory releases to estuaries; to meet supplemental agricultural irrigation demands; and increase flood protection within the Everglades Agricultural Area. Conveyance capacity of the Miami and North New River Canals between Lake Okeechobee and the Storage Reservoirs are increased to convey additional Lake Okeechobee flood control releases that would have otherwise been discharged to the Caloosahatchee and St. Lucie Estuaries.

Operation: Inflows are from Lake Okeechobee regulatory discharges and runoff from Miami & North New River Canal basins. The reservoir will be divided into two compartments.

Compartment 1: 20,000 acres, meets EAA irrigation demands only. The source of water is excess EAA runoff (inlet capacities for excess runoff (2700 and 2300 cfs) and outlet capacities for EAA demands same as Alternative 2). Overflow to compartment 2 occurs when depth of water in compartment approaches 6 feet maximum and Lake Okeechobee regulatory discharges are not occurring or impending. Excess EAA runoff is diverted to this compartment ONLY if WCA-3A is too deep.

Compartment 2: 40,000 acres, meets environmental demands as a priority, but can supply a portion of EAA irrigation demands if environmental demands equal zero. The sources of water are overflow from compartment 1 and Lake Okeechobee regulatory releases.

The conveyance capacity of the northern reaches of the Miami and North New River Canals in the EAA are tripled (200% increase) for Lake Okeechobee regulatory releases as in Alternative 2. Structures with a capacity of 4500 cfs for regulatory releases from Lake Okeechobee via Miami Canal and a capacity of 3000 cfs for releases via North New River Canal are added for Compartment 2. When the reservoir depths fall below 0.0 feet, Lake Okeechobee is used for meeting supplemental irrigation and environmental demands. The flows will be delivered to the Water Conservation Areas through Stormwater Treatment Areas

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3 and 4.

Design:

Compartment 1: 1-20,000 acre reservoir at 6 feet maximum depth.

Inflow structure capacity: inflow pumps of 2700 cfs Miami Canal Basin and 2300 cfs North New River Canal Basin for diversion of EAA runoff.

Outflow structure capacity:

To Everglades Agricultural Area: 1-3000 cfs structure to Miami Canal Basin and 1-4400 cfs structure to North New River and Hillsboro Basins (initially assumed to not constrain performance).

Compartment 2: 1-40,000-acre reservoir at 6 feet maximum depth

Inflow structure capacity:

inflow pumps of 4500 cfs and 3000 cfs for diversion of Lake Okeechobee regulatory releases.

Outflow structure capacity:

To Stormwater Treatment Areas 3 and 4: 3600 cfs @ 6 feet head.

Increase in Miami & North New River Canal capacities (200%).

To Miami Canal: 4500 cfs

To North New River Canal: 3000 cfs

Location: To be determined - conceptually located between Miami & North New River Canals for Water Management Model simulation purposes only.

Counties: Palm Beach

Assumptions and related considerations:

- 1) Land Availability.
- 2) Modifications to Stormwater Treatment Areas if needed for Everglades water deliveries to meet the appropriate water quality.

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Component H3

Geographic Region: Water Conservation Areas and Everglades National Park

Component Title: Everglades Rain-Driven Operations

Purpose: Improve timing and location of water depths in the Water Conservation Areas (WCAs) and Everglades National Park (ENP).

The rain-driven operational concept is a basic shift from the current operational practice which uses calendar-based regulation schedules for the WCAs. Regulation schedules, also referred to as flood-control schedules, typically specify the release rules for a WCA based on the water level at one or more key gages. Regulation schedules do not typically contain rules for importing water from an upstream source. The schedules also repeat every year and make no allowance for inter-annual variability. The rain-driven operational concept includes rules for importing and exporting water from the WCAs in order to mimic a desired target stage hydrograph at key locations within the Everglades system. The target stage hydrographs mimic an estimate of the more natural (pre-drainage Everglades) water level response to rainfall.

Operation:

Note that for the description below, the term "trigger level" means the water level used to trigger action at an upstream or downstream structure. Trigger levels are related to the target stage hydrographs by simple offsets which typically range less than +/-1.0ft. There is usually one trigger level for the import rules; and two trigger levels associated with the exportation of water. The two export trigger levels define two release zones. The lower zone is a conditional release zone; so releases are made only if the downstream area has a "need". The upper zone is an unconditional release, or flood control, release zone; so releases are made in this zone even if the downstream area doesn't "need" the water.

WCA-1:

No rain-driven operations (use 1995 interim regulation schedule)

WCA-2 Import Rules:

Import water from Lake Okeechobee via STA-2 if water levels fall below trigger levels at either of the following locations:

- a. Northern 2A (SFWMM grid cell R45C28)
- b. 2A-17 gage

WCA-2 Export Rules:

- a. Export water from WCA-2A to WCA-2B via S-144, S-145 & S-146, if levels

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at 2A-17 exceed trigger levels.

b. Export water from WCA-2A via the S-11's if levels at 2A-17 exceed triggers.

WCA-3 Import Rules:

a. Import water from EAA storage and/or Lake Okeechobee via STA-3/4 to:

(1) Northeast WCA-3A if levels fall below trigger levels at 3A-NE.

(2) Northwest WCA-3A (via L-5/L-4, S8, G404, and spreader along L-4) if levels fall below trigger levels at 3A-NW.

(3) Central WCA-3A, via S-140, if levels fall below trigger levels at 3A-2.

(4) Central WCA-3A via S-339; if levels fall below trigger levels at 3A-4, then excess water from S-8 is passed through S-339 (S-340 remains closed except for LECSA water supply deliveries).

(5) Southern WCA-3A, via S-150, and the canals adjacent to L-38W, L-68A, and L-67A, if water levels fall below trigger levels at the 3A-28 gage location.

b. Import water from WCA-2A via S-11's if levels fall below trigger levels at 3A-3 (and WCA-2 has excess water {levels at 2A-17 significantly exceed targets}).

WCA-3 Export Rules:

a. Export water from WCA-3A to WCA-3B via proposed S-345 structures if average of water levels at 3A-28 and R33C26 exceeds trigger levels.

b. Export water from WCA-3A to WCA-3B via S-151 if water levels at R33C26 exceed trigger levels.

c. Export water from WCA-3A to NWSRS via S-12 structures if levels at 3A-28 exceed trigger levels.

d. Export water from WCA-3A to NESRS via S-333 if levels at 3A-28 exceed trigger levels.

e. Export water from WCA-3B to central lakebelt storage area, via S-31, if water levels at R30C27 exceed trigger levels.

ENP Import Rules:

a. Import water to NESRS from WCA-3A, via S-333 and proposed S-345 and S-355 structures, if average of water levels at NESRS-1 and NESRS-2 falls below trigger levels.

b. Import water from WCA-3A to NWSRS via the S-12 structures if average of water levels at G-620 and P-33 falls below trigger levels.

Big Cypress National Preserve Import Rules:

a. Import water from WCA-3A, via S-344 and the S343A&B structures, if average water levels (R22C13 & R26C13) fall below trigger levels, and if water levels at 3A-28 are significantly above trigger levels. Note that for this component (H), seasonal operations as defined in component HH3 restricts flows during January through June.

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Design: Deliveries from upstream sources (Everglades Agricultural Area (EAA) runoff, EAA storage area, and/or Lake Okeechobee) through the Stormwater Treatment Areas (STAs) prior to release into the WCAs. Distribution of STA outflow designed to improve hydropatterns. Only excess flows from the SDCS (L-30 & L-31N) are discharged to NESRS via S-356A&B.

Location: Within the existing boundaries of the WCAs and ENP.

Counties: Broward, Dade, Monroe, and Palm Beach

Assumptions and related considerations:

- (1) Consideration given to tree islands and minimum floor levels consistent with SFWMD's proposed minimum flows and levels for these areas.
- (2) Potential increases in hydropatterns in relatively overdrained areas (e.g., northern WCA-3A) and decreases in hydropatterns in deep water areas (e.g., southern WCA-3A).

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Component I3

Geographic Region: Water Conservation Areas and Everglades National Park

Component Title: Improved Conveyance between Water Conservation Area 3B and Everglades National Park

Purpose: Improve water deliveries to Everglades National Park from Water Conservation Area 3B by increasing conveyance capacity through L-29 and US Highway 41 (Tamiami Trail).

Operation: Increase conveyance by converting S-355 structures to pumps totaling 2000 cfs capacity. Elevating or bridging portions of US Highway 41 (Tamiami Trail) will remove water level constraints allowing greater conveyance into Everglades National Park. The pumps would be operated consistent with Everglades Rain-Driven Operations Component H3.

Design:

- (1) Two 1000 cfs pumps instead of the S-355 structures proposed as part of the Modified Water Deliveries Project. This would provide pump conveyance capacity of 2000 cfs.
- (2) Raise Tamiami Trail by bridging and elevating portions of the Trail below Water Conservation Area 3B.

Location: Within the existing boundaries of the Water Conservation Areas and Everglades National Park.

Counties: Miami-Dade, Monroe

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Component J

(not included in this Alternative)

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Component K2

Geographic Region: Water Preserve Area - Palm Beach County

Component Title: L-8 Project - SEE COMPONENT MAP 1

Purpose: Reduce water supply restrictions in the Northern Palm Beach County Service Area by capturing more of the annual discharges from portions of the southern L-8, C-51 and C-17 basins and route this water to the West Palm Beach Water Catchment Area. Intent is to increase water supply availability and provide pass through flow to enhance hydroperiods in Loxahatchee Slough and increase base flows to the Northwest Fork of the Loxahatchee River.

Operation: Capture excess L-8, C-51 and C-17 basin water to meet urban water supply demands in the Northern Palm Beach County Service Area and enhance hydroperiods in the Loxahatchee Slough. Water would be diverted through the M-canal to the Water Catchment Area. Stormwater treatment areas will be provided to meet all water quality standards required if necessary.

Design:

- Increase the pumping capacity from the L-8 Tieback into the M-Canal to 300 cfs to increase the volume of water captured from the southern L-8 canal and deliver it to the Water Catchment Area. This pump has dual purpose, 1) to capture L-8 basin runoff when available and 2) to deliver regional deliveries when needed.
- Assume that the Indian Trail Improvement District will adopt an operation plan which promotes water conservation by prioritizing discharge so that excess storm water is first offered to the City of West Palm Beach Water Catchment Area and secondarily discharged through off peak releases to the C-51 Canal via the M-1 Canal. For this alternative pumping from Indian Trail Improvement District into the M-Canal for subsequent discharge into the City of West Palm Beach Water Catchment Area will be assumed to occur under the following conditions
 - When the City of West Palm Beach Water Catchment Area has sufficient need for imported water as defined by being below 18.2 feet NGVD.
 - When water levels in the Lower M-1 Basin exceed 14.0 feet NGVD during the wet season (June 1 through October 31) or 16.0 feet NGVD during the dry season (November 1 through May 31) the Lower M-1 Basin may discharge up to 200 cfs for subsequent storage.
 - When water levels in the Upper M-1 Basin exceed 15.0 feet NGVD

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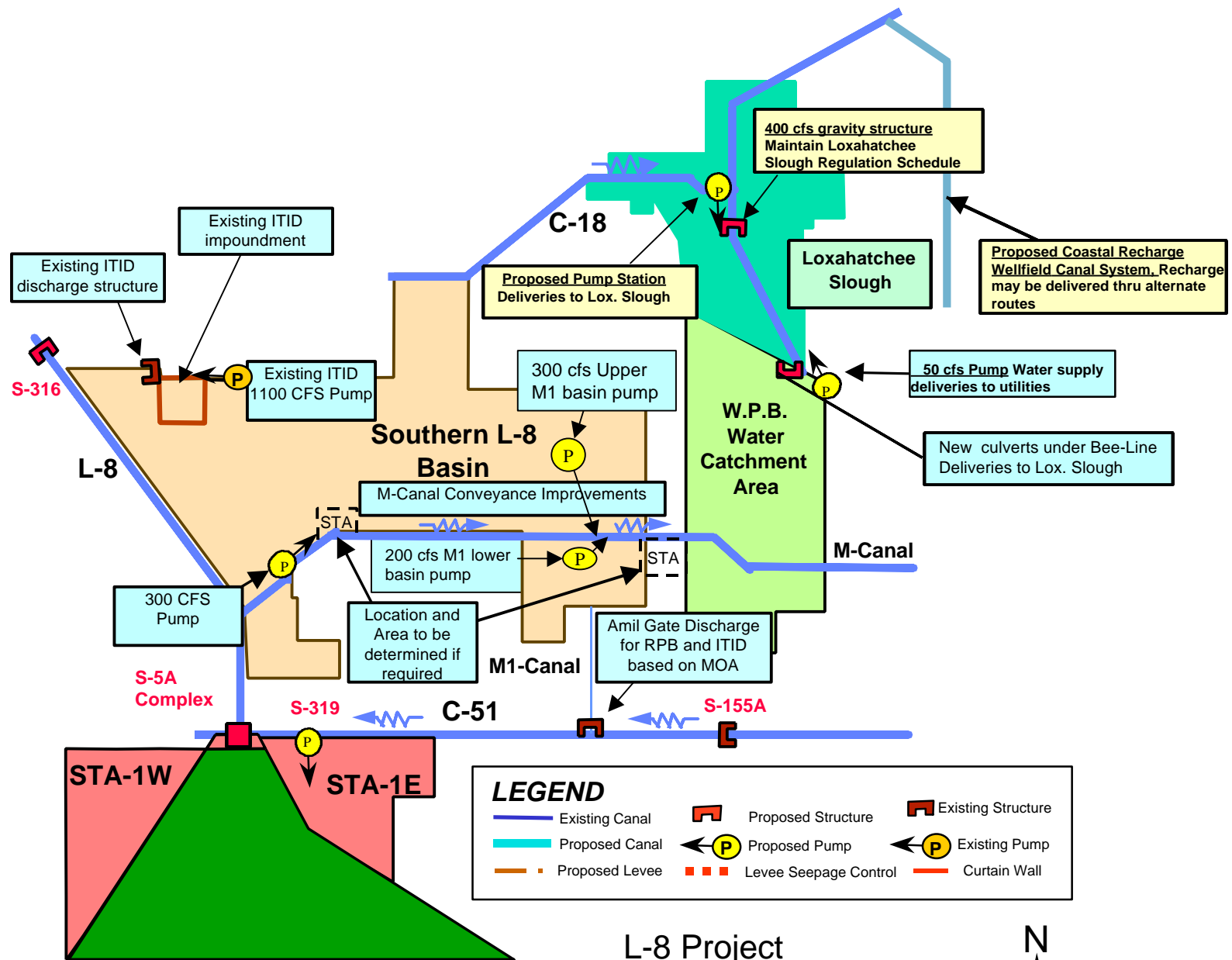
during the wet season or 16.0 feet NGVD during the dry season) the Upper M-1 Basin may discharge up to 300 cfs for subsequent storage.

- Increase conveyance of the M-canal between the pump and the Water Catchment Area to accommodate the increased inflow from the L-8 Canal and the Indian Trail Improvement District.
- Install a new structure in the south leg of C-18 just south of the west leg to facilitate better management of water levels and discharges from the Loxahatchee Slough. The new gravity structure would consist of a variable discharge up to 400 cfs and emergency overflow weirs.
- 50 cfs pump for water supply deliveries to utilities.
- New culverts under Bee-Line Highway for up to 100 cfs deliveries to Loxahatchee Slough.
- Eliminate ASR component described in the Future Without Project Condition

Location: Southern L-8 Basin including the Indian Trail Improvement District, West Palm Beach Water Catchment Area, and the Loxahatchee Slough
Counties: Palm Beach

Assumptions and related considerations:

- 1) Should help maintain stages in the Loxahatchee Slough and reduce high discharges to the southwest fork of the Loxahatchee River.
- 2) Stormwater Treatment Area upstream of the Water Catchment Area may be needed.
- 3) Secondary structures (recharge canals) may be needed downstream of the Water Catchment Area to provide water to achieve the desired result.
- 4) Due to lack of long term storage (ASR) hydroperiod enhancements within the West Palm Beach Water Catchment Area are not being considered in the alternative.



L-8 Project
Alternative A
Component Map 1

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Not to scale

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Component L3

Geographic Region: Lower East Coast Service Area

Component Title: Change Coastal Wellfield Operations

Purpose: Shift demands from eastern wellfields to western facilities away from the saltwater interface to reduce impact of salt water intrusion.

Operation: For coastal utilities in the Lower East Coast Service Area which are experiencing an increased threat of saltwater intrusion, demands will be shifted from the eastern facilities to the western facilities away from the saltwater interface. The volume shifted is dependent upon the degree of saltwater intrusion but is generally proportional to the increase in demands between the 1995 existing conditions and the 2050 future without project conditions unless otherwise noted.

Design: For this alternative the following utilities have a portion of their demands shifted inland and include Riviera Beach, Lake Worth, Lantana, Manalapan, Boca Raton, Hollywood (including Broward County 3B and 3C), Dania, Miramar, Broward County 3A, Hallandale and Florida City. Redistribution of demands for Lake Worth, Lantana, Manalapan, Boca Raton and Florida City are generally consistent with the Lower East Coast Water Supply Plan. For the City of Riviera Beach, demands will be shifted from the eastern facilities to the western facilities with the western facilities absorbing the increased demand between the 1995 and 2050 conditions. For this alternative, the City of Miramar's eastern wellfield will be placed on standby and all demands will be met from the western wellfield. For the City of Hollywood, Hallandale, Dania, Broward County 3A, and Broward County 3B/3C all these wellfields will be placed on standby and the entire demand (with the exception of 4 MGD from the Floridan aquifer for Hollywood) will be met from the South Broward County Regional wellfield. Recharge to the Regional wellfield will be met through the existing canal system supplied from locally captured runoff from the C-9 Basin (Components R and S).

Location: Lower East Coast Service Area.

Counties: Broward, Miami-Dade and Palm Beach.

Assumptions and related considerations:

- 1) It is assumed that the western facilities of the individual utilities have sufficient capacity to meet the increased demands.

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Component M4

Geographic Region: Water Preserve Area - Palm Beach County

Component Title: Site 1 Impoundment – SEE COMPONENT MAP 2

Purpose: Water supply storage reservoir to supplement water deliveries to the Hillsboro Canal during the dry-season.

Operation: The reservoir will be filled during the wet-season from excess water in Hillsboro Canal (backpumped). Water will be released back to Hillsboro Canal to help maintain canal stages during the dry-season. If water is not available in the reservoir, existing rules for water delivery to this region will be applied. Aquifer Storage and Recovery (ASR) is being incorporated to improve efficiency. Fifteen (15) 5 MGD capacity ASR wells will be added (total injection and recovery capacity 75 MGD). Water from the Site 1 Impoundment will be injected when stages in the impoundment are >14.0 feet NGVD (3 feet of depth in the impoundment). Water will be recovered from the ASR wells when stages in the Hillsboro Canal are <7.0 feet NGVD.

Design:

1660 acres with a maximum depth of 6 feet.

Inflow pump capacity = 500 cfs.

Outflow structure capacity = 200 cfs @ 4 feet head.

Emergency outflow structure = 500 cfs.

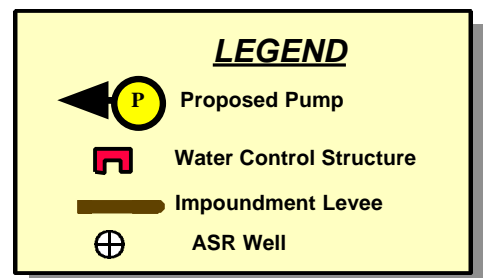
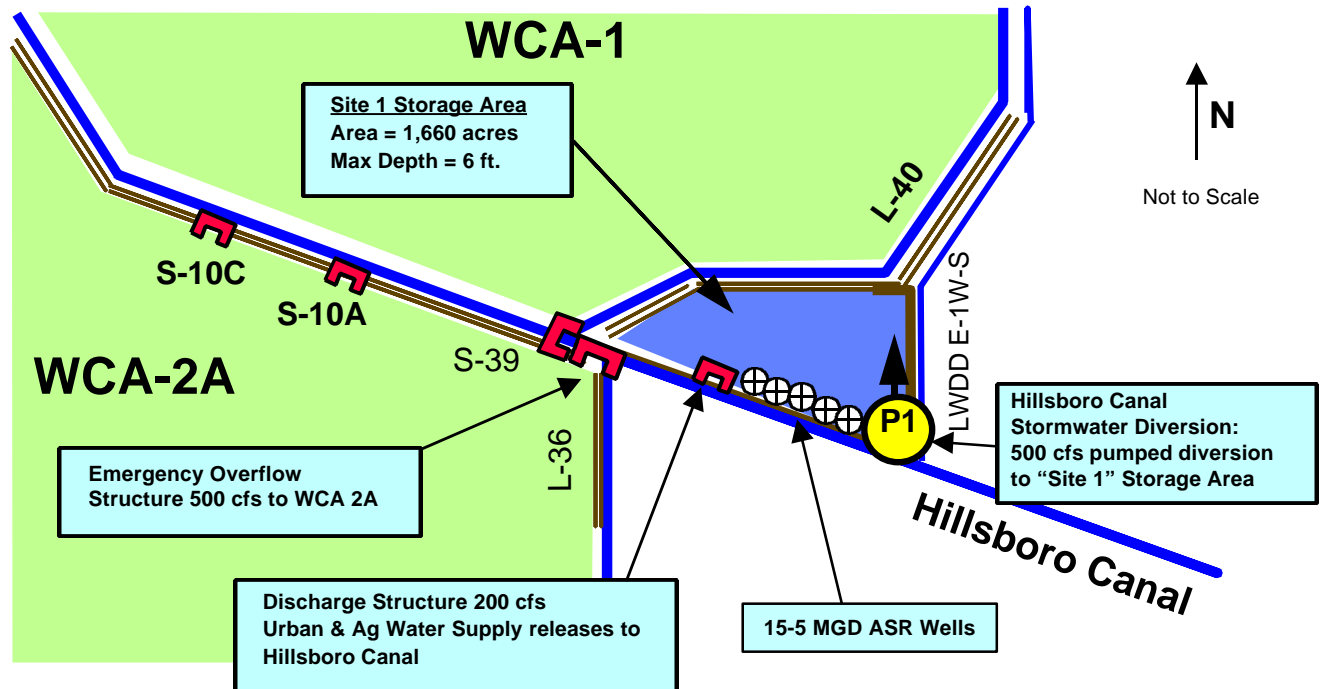
Fifteen (15) – 5 MGD ASR wells (total capacity 75 MGD).

Location: The Water Preserve Area Land Suitability Analysis previously identified 1660-acre site.

Counties: Palm Beach

Assumptions and related considerations:

- 1) Excess storage could be discharged to Water Conservation Area 2A if a treatment facility could be added to meet Everglades' water quality standards.
- 2) Recovery rate of 70% efficiency for ASR wells is assumed.



Alternative A
Site 1 Impoundment
Component Map 2

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Component N2

Geographic Region: Water Preserve Area - Broward County

Component Title: Water Conservation Area 2B Levee Seepage Management -
SEE COMPONENT MAP 3

Purpose: Seasonal seepage management along the eastern edge of Water Conservation Area 2B to reduce losses due to levee seepage to the Lower East Coast.

Operation: Reduction in levee seepage flow from Water Conservation Area 2B to the coastal area during the wet season (June-October) by pumping North New River south. (See Component P.)

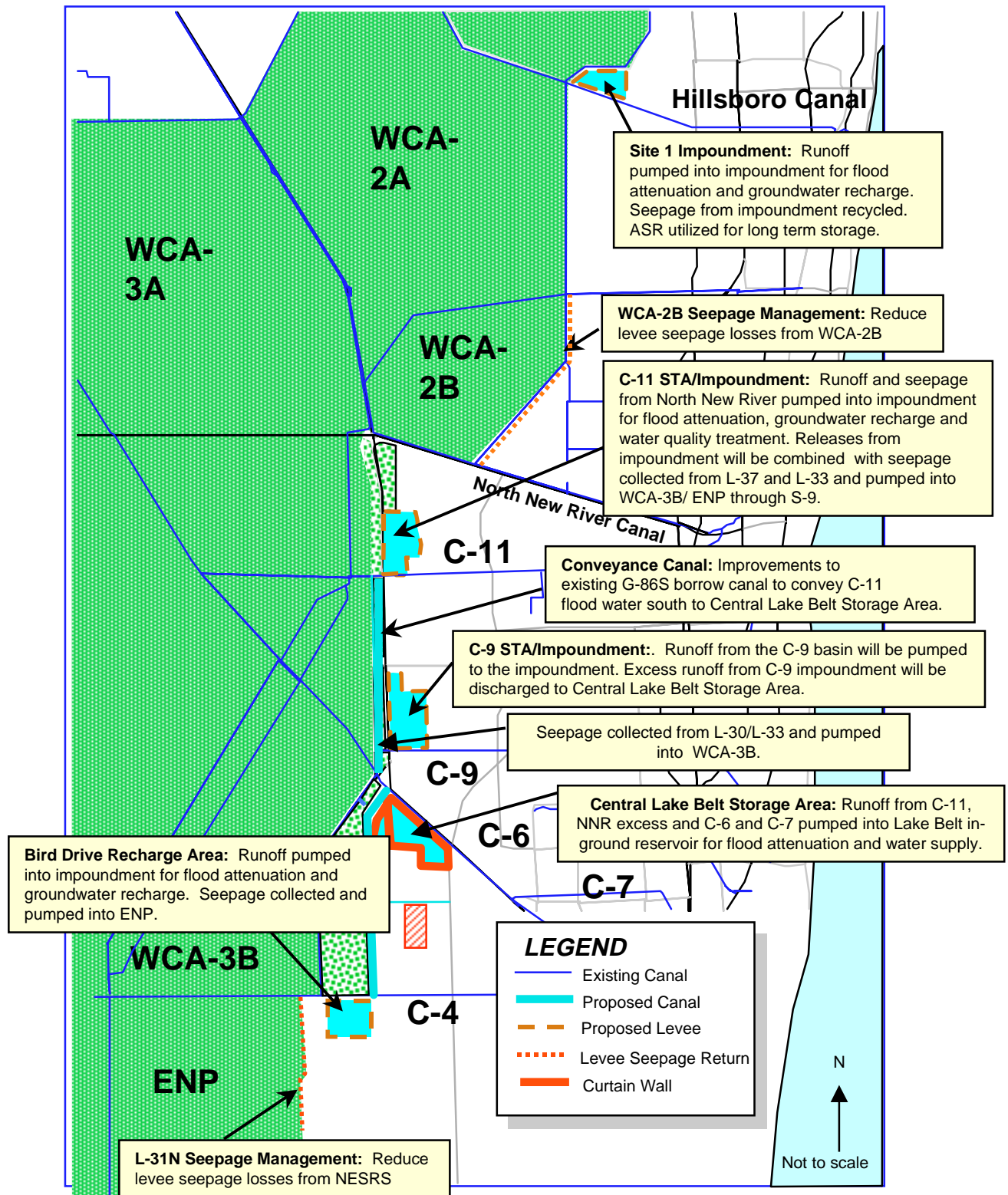
Design: Capture all levee seepage from L-35A borrow canal along Water Conservation Area 2B between S-124 to S-38A. Open S-124 during the wet season to pump all seepage south through Component P. During dry season close S-124 and only pump North New River.

Location: Along the existing eastern protective levee adjacent to Water Conservation Area 2B.

Counties: Broward

Assumptions and related considerations:

- 1) Seepage from Water Conservation Area 2B into North New River is addressed by North New River Water Preserve Area component.
- 2) Additional water retained in the regional system will be used to restore hydropatterns and water supply to the Lower East Coast.



**General Water Preserve Area Components
Alternative A
Component Map 3**

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Component O1

Geographic Region: Water Preserve Area - Broward County

Component Title: Water Conservation Area 3A and 3B Levee Seepage Management – SEE COMPONENT MAP 4

Purpose: Reduce seepage from Water Conservation Areas 3A and 3B to improve hydropatterns within the Conservation Areas by utilizing the marsh areas that are located east of the Water Conservation Areas and west of U.S. Highway 27. Allow higher water levels and longer inundation durations within those marshes. Seepage from the marshes will be collected and returned to the Water Conservation Areas to maintain flood protection. Serves to separate Water Conservation Area 3A seepage water from urban runoff originating in the C-11 Basin.

Operation: Seepage collected in the L-37 and L-33 borrow canals will continue to be backpumped through the existing S-9 pumping station. Seepage from the marsh areas will also be routed through the existing S-9 pumping station. Inflows from other sources will be diverted to storage.

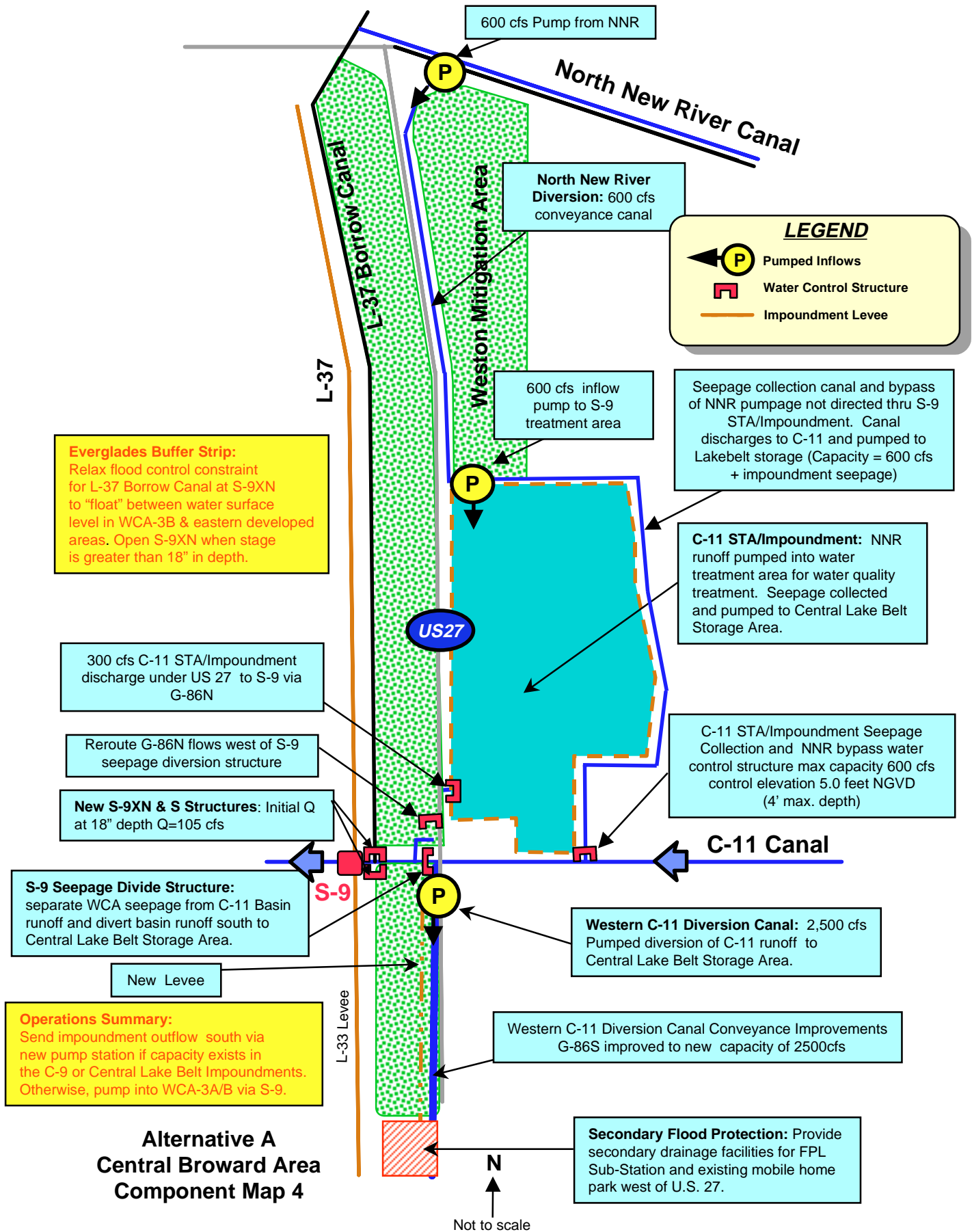
Design: New levees will be constructed west of U.S. Highway 27 from the C-11 Canal to the C-6 Canal to separate seepage water from the urban runoff in the C-11 diversion canal (Component Q). Allow higher water levels in the marshes east of the Water Conservation Areas. A divide structure will be added to the C-11 Canal west of Highway 27 to prevent drainage in the C-11 Canal to be backpumped into Water Conservation Area 3A through the S-9 pumping station. Water from C-11 west will be diverted to the Central Lake Belt Storage Area component.

Location: Seepage collected in borrow canals along the existing eastern protective levee adjacent to Water Conservation Area 3A and 3B. Divide structure located in C-11 Canal east of Highway 27.

Counties: Broward

Assumptions and related considerations:

- 1) It is assumed that the seepage from the Water Conservation Areas meets water quality standards necessary to achieve ecosystem restoration.



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C&SF Comprehensive Review Study – Alternative A

Component P2

Geographic Region: Water Preserve Area - Broward County

Component Title: North New River Diversion Canal and Treatment Facility –
SEE COMPONENT MAP 4

Purpose: Capture excess North New River and Water Conservation Area 2B water to store and treat in western C-11 Basin to be backpumped to Water Conservation Area 3A (1) to restore a portion of water deliveries to Water Conservation Area 3A that are eliminated by segregating the C-11 runoff from levee seepage and (2) to reduce stages above NSM in Water Conservation 2B and (3) to divert water through Water Conservation Area 3A and 3B to North East Shark River Slough. Western C-11 runoff that is presently backpumping untreated runoff into Water Conservation Area 3A will be released into the new canal and diverted to the Central Lake Belt Storage Area (see C-11 Diversion Canal component).

Operation: Western North New River water will be conveyed through a diversion canal adjacent to Highway 27 (east) to a water quality treatment facility north of C-11 for eventual backpumping to the Water Conservation Area 3A through the existing pump station S-9. Quantities from North New River that exceed the treatment facility capacity will be routed around the treatment facility to C-11. Outflows from the treatment facility can begin at 0.5 feet depth and will be made to the L-37 borrow canal and ultimately to Water Conservation Area 3A through S-9.

During the wet season (June through October) operate S-124 to direct eastern Water Conservation Area 2B levee seepage to the North New River to be pumped south (see Component N).

Additionally, operate S-141 to discharge 100 cfs from Water Conservation Area 2B through S-34 to North New River when Water Conservation Area 2B is above NSM levels.

Design:

- (1) 600 cfs diversion canal (east of Highway 27) between North New River and water quality treatment facility.
- (2) Intermediate 600 cfs pump station in the diversion canal may be needed.
- (3) C-11 STA/Impoundment (S-9 Water Quality Treatment Area)
 - 1600 acres with a maximum depth of 4 feet.
 - Inflow structure: 600 cfs pump (to be resized as needed).

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C&SF Comprehensive Review Study – Alternative A

Outflow structure: Gravity structure with 300 cfs capacity at 4 feet of head.

Outflow Canal: 400 cfs between treatment area and L-37 borrow canal

(under US 27).

(4) 600 cfs bypass canal and water control structure upstream of C-11.

(5) 100 cfs of S-141's 435 cfs capacity operated to lower stages in Water Conservation Area 2B when elevations are above NSM.

Location: The diversion canal is located east of US 27 between North New River Canal and the Water Quality Treatment facility. The Water Preserve Area Land Suitability Analysis identified site for the Water Quality Treatment facility. The site is located north of C-11 just east of US-27.

Counties: Broward

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C&SF Comprehensive Review Study – Alternative A

Component Q1

Geographic Region: Water Preserve Area - Broward County

Component Title: Western C-11 Diversion Canal -- to Central Lake Belt Storage Area – SEE COMPONENT MAP 4

Purpose: Divert untreated runoff from western C-11 that is presently discharged into Water Conservation Area 3A and excess flows from the North New River Canal and C-9, to the Central Lake Belt Storage Area.

Operation: All runoff in the western C-11 canal that is presently backpumped into Water Conservation Area 3A will be diverted to the Central Lake Belt Storage Area.

Design:

- (1) 2500 cfs diversion canal west of U.S. 27 between C-11 and C-9 and a 2500 cfs diversion canal between C-9 and the Central Lake Belt Storage Area.
- (2) Intermediate 2500 cfs pump station in the diversion canal south of C-11 may be needed.

Location: The diversion canal is located west of US-27 between C-11 and the Central Lake Belt Storage Area.

Counties: Broward, Miami-Dade

Assumptions and related considerations:

- 1) Flood protection component for FPL substation and mobile home park may be needed.

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C&SF Comprehensive Review Study – Alternative A

Component R3

Geographic Region: Water Preserve Area - Broward County

Component Title: C-9 Stormwater Treatment Area/ Impoundment B SEE
COMPONENT MAP 5

Purpose: Capture runoff from western C-9 basin by backpumping into the C-9 Stormwater Treatment Area (STA)/Impoundment area. The facility will provide flood peak attenuation within the basin, groundwater recharge and seepage control.

Operation: Runoff from western C-9 basin will be backpumped into the STA/ Impoundment area. Excess water up to 500 cfs from the C-9 STA/Impoundment will be discharged south to the Central Lake Belt Storage Area via a new conveyance canal. Discharges from the C-9 STA/Impoundment will be to the Central Lake Belt Storage Area. Outflows to C-9 as needed for water supply purposes will be delivered from Central Lake Belt Storage Area. Seepage from C-9 STA/Impoundment will be collected and returned to the impoundment.

Design:

2500 acres with a maximum depth of 4 feet.

Inflow structure: 1500 cfs pump (to be resized as needed).

Outflow structure (Central Lake Belt Storage Area): Gravity structure with 500 cfs capacity at 4 foot head. Discharge C-9 STA/Impoundment completely to Central Lake Belt Storage Area (no water held in reserve since it is more effectively stored and utilized there).

Divide structure assumed between the pump and gravity structure to prevent recycling during events when impoundment is discharging to Central Lake Belt Storage Area. This structure must be operated (opened) during water supply deliveries from the Central Lake Belt Storage Area to the C-9 Canal.

Seepage Collection: 200 cfs recycled into the impoundment area.

Location: Site identified by Water Preserve Area Land Suitability Analysis
Counties: Broward

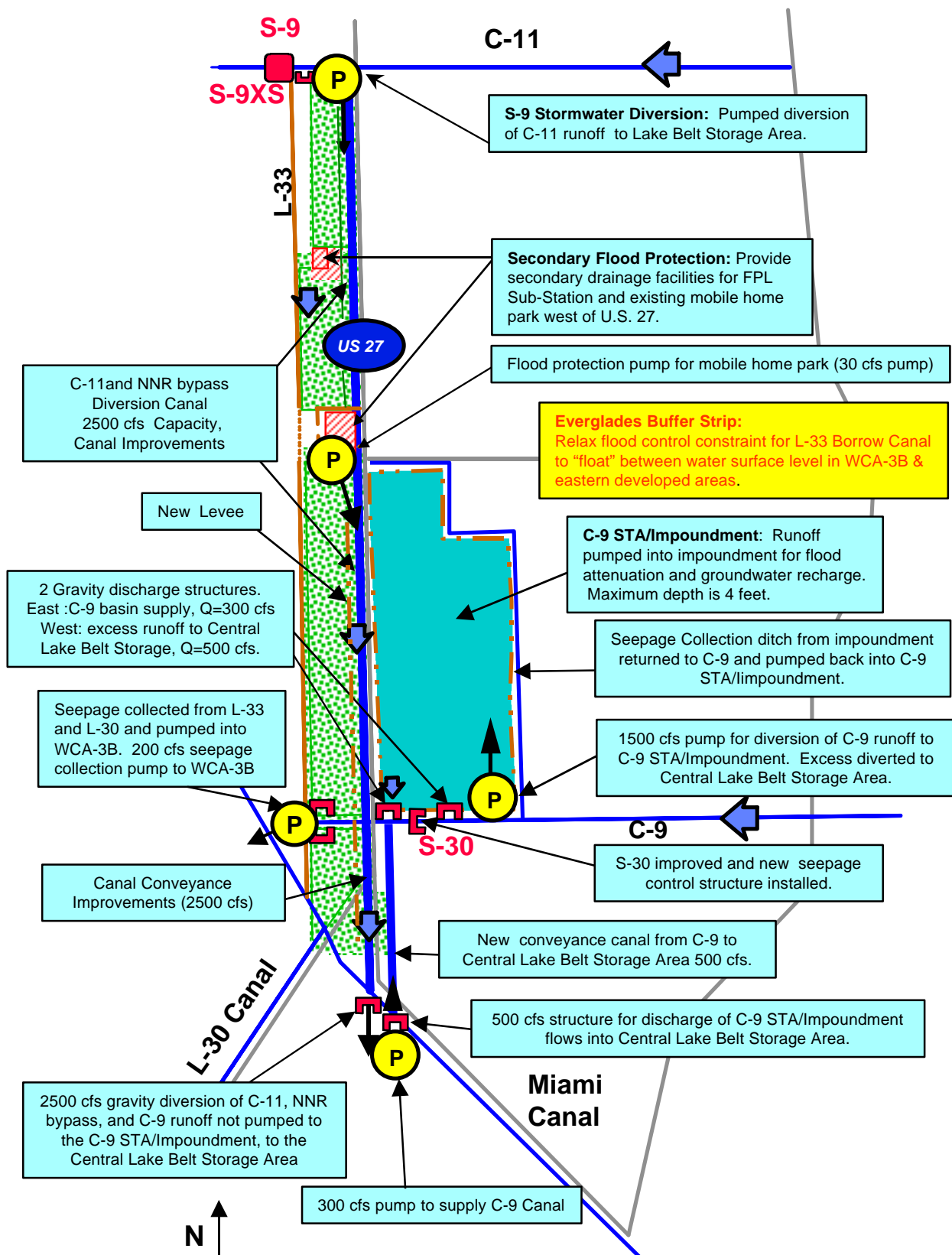
Assumptions and related considerations:

1) Treatment facility needed if stored water is backpumped into Water

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C&SF Comprehensive Review Study – Alternative A

Conservation Area 3A.



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C&SF Comprehensive Review Study – Alternative A

Component S3

Geographic Region: Water Preserve Area – Miami-Dade County

Component Title: Central Lake Belt In-ground Storage Area B SEE
COMPONENT MAP 6

Purpose: In-ground reservoir to capture a portion of runoff from western North New River, C-11, C-9, C-6 and C-7 basins. The in-ground reservoir will allow storage of untreated runoff without concerns of ground water contamination. The stored water will be used to maintain stages during the dry season in the C-9, C-6, Northwest wellfield protection canal, C-4, C-2 and the South Dade Conveyance System Canals.

Operation: Inflows from C-6 (west of the proposed divide structure), western C-11, and portions of runoff from North New River and C-9 basin runoff are both pumped and gravity fed into in-ground reservoir. Inflow ceases when stages reach ~5.0 feet NGVD (0 feet above adjacent land elevation).

Outflows for water supply are made to South Dade Canal System (via 400 cfs pump to L-30), Northwest wellfield protection canal (via a 500 cfs pump), the C-6 Canal (via a 300 cfs pump) and the Dade-Broward Levee canal (via a 100 cfs pump). Supply from the reservoir can be withdrawn for stages down to –7.5 feet NGVD for South Dade Canal System and Dade-Broward Levee. For Snapper Creek Canal (C-2 and C-4 deliveries), C-6 and C-9 Canals can be made down to -20 feet NGVD (up to 25 feet of working storage & maximum head on seepage barrier). Demands met from reservoir outflow via the NW Wellfield Delivery Canal/Snapper Creek Canal and the Dade-Broward Levee canal will be passed through a Stormwater Treatment Area prior to discharge. (Note: SFWMM simulation assumes 5120 acres of surface area. To simulate equivalent working storage volumes, the simulated water levels are higher from those prescribed here.)

Design:

Reservoir: 4000 acres with subterranean seepage barrier around perimeter to enable drawdown during dry periods and to prevent water quality impacts to the northwest Miami-Dade wellfield.

Inflow Structures: 2500 cfs gravity structure from North New River and C-11W.

500 cfs gravity structure from C-9.

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C&SF Comprehensive Review Study – Alternative A

300 cfs pump from C-7.

600 cfs pump from C-6 west of divide structure.

Outflow Structures: 400 cfs pump to L-30 for deliveries to South Dade

Conveyance system:

300 cfs pump to C-6.

100 cfs pump to Dade Broward Levee to maintain 4.5 feet NGVD.

300 cfs pump to C-9 southern ext. to supply C-9 to prevent saltwater intrusion.

500 cfs pump to NW wellfield protection canal/Snapper Creek (C-2), C-4.

Water supply discharges are routed to C-4/C-2 via Northwest wellfield protection canal system. To route water supply deliveries from the Central Lake Belt Storage Area or regional system to the wellfield protection canal and to C-2/C-4 the capacities of several structures were increased as follows:

- 1) L-30 to Northwest wellfield protection canal from 200 to 600 cfs @0.5 feet head.
 - 2) Northwest wellfield lateral canal (Snapper Creek extension) from 300 to 900 cfs @ 0.5 feet head.
 - 3) Snapper Creek extension to C-2/C-4 300 cfs @0.5 ft head (no change).
- (Note: structures may be re-sized as determined via more detailed analyses.)

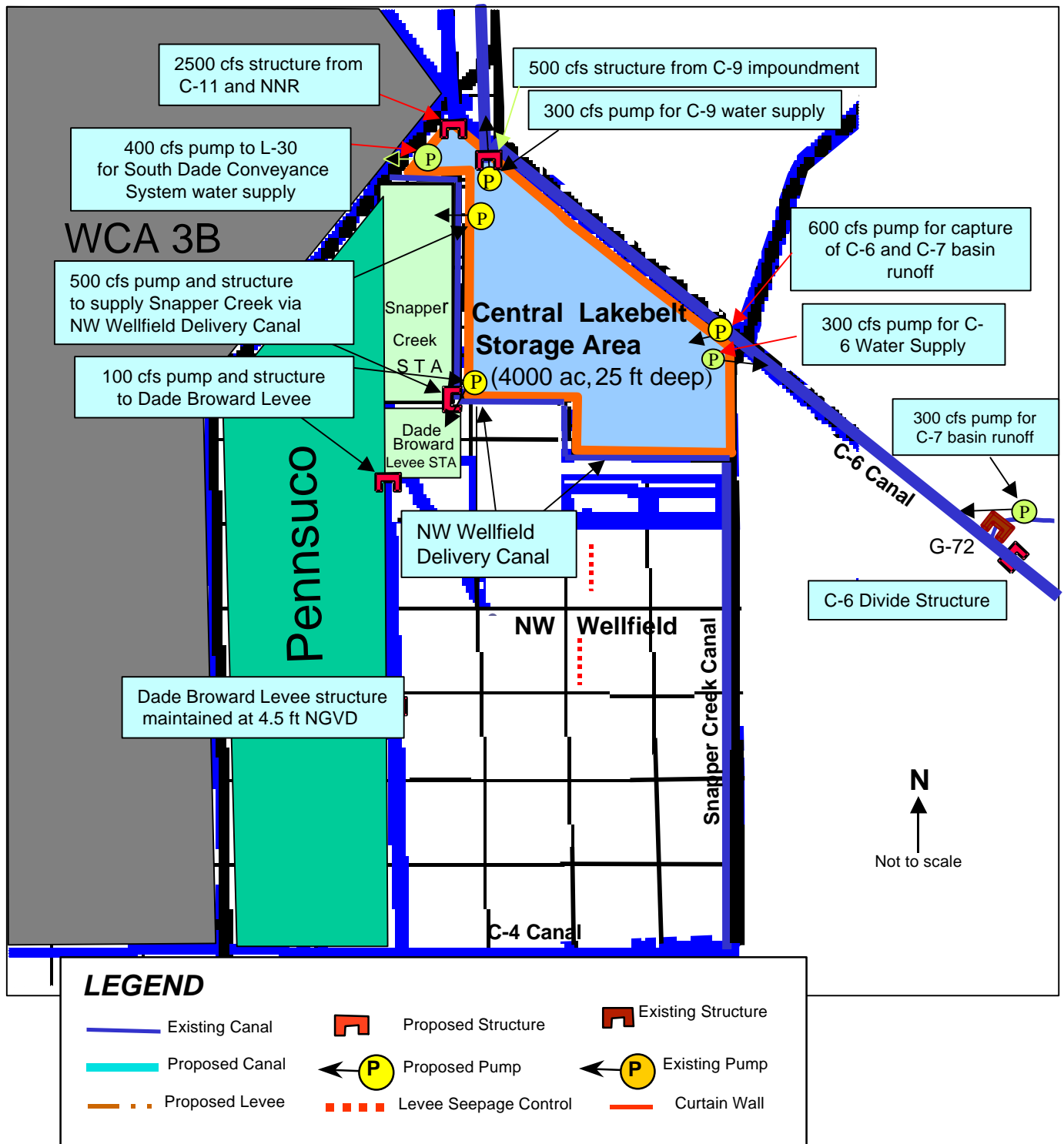
Stormwater Treatment Area: 1200 Acres for treatment of Total Phosphorus from 50 to 40 ppb. (Stormwater Treatment Area detention time requirements need to be addressed. Pretreatment in reservoir may reduce size requirements of treatment area).

Location: Reservoir would be within the area proposed for rock mining by the Lake Belt Issue Team. It would be sited south of Miami Canal (C-6) and North of the NW wellfield delivery canal to minimize impacts to the wellfield and between Pennsuco wetlands and Snapper Creek.

Counties: Miami-Dade

Assumptions and related considerations:

- 1) No adverse effect of a subterranean wall on Miami-Dade County's NW wellfield.
- 2) Treatment facility needed if stored water is backpumped to the Everglades.
- 3) All water quality considerations will be addressed regarding releases from the reservoir to the water supply wellfields.
- 4) Impacts on the cone of influence of the Northwest Wellfield and its effect on



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C&SF Comprehensive Review Study – Alternative A

wetland mitigation around the wellfield.

- 5) Limestone Filter Treatment system within the Reservoir may be developed through use of compartmentalization of rockmining excavation pattern.

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C&SF Comprehensive Review Study – Alternative A

Component T6

Geographic Region: Water Preserve Area – Miami-Dade County

Component Title: C-4 Structures

Purpose: Proposed structures (East and West) would provide two separate benefits. The West structure would control water levels in the C-4 Canal at higher elevation to reduce seepage losses from the Pennsuco Wetlands and areas to the west of the structure and the East structure would reduce regional system deliveries by diverting dry season stormwater flows to the C-2 Canal to increase recharge nearby several coastal wellfields.

Operation: The West structure would maintain water levels at 6.5 feet NGVD for seepage control purposes and be capable of passing flood flows with a minimum of head loss and supplying water to the C-4 basin to meet demands. The East structure would divert dry season stormwater flows from the western C-4 basin to the C-2 Canal to recharge the wellfields in the eastern C-2 basin.

Design: East Structure- Operable lift-gate with 6.5 feet NGVD overflow and approximately 400 cfs capacity (final design specifications will be determined in detailed design and hydrologic and hydraulic modeling in the future).

Location: Just downstream of the Dade-Broward Levee in C-4 Canal.

West Structure- Operable lift-gate with 4.5 feet NGVD overflow and approximately 600 cfs capacity (final design specifications will be determined in detailed design and hydrologic and hydraulic modeling in the future).

Location: In C-4, just downstream of the confluence of the C-2 and C-4 Canals.

Assumptions and related considerations:

- 1) Benefits to WCA-3B associated with improved C-4 seepage control are directly related to the proposed S-356 pumpage (Modified Water Deliveries).
- 2) Head losses across the proposed structures will not inhibit passing flood releases when necessary.
- 3) A pump may be associated with the West structure if back pumping the C-4 basin runoff to the Bird Drive Recharge Area becomes a component of the final alternative.

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C&SF Comprehensive Review Study – Alternative A

Component U3

Geographic Region: Water Preserve Area – Miami-Dade County

Component Title: Bird Drive Recharge Area - SEE COMPONENT MAP 7

Purpose: Capture runoff from western C-4 basin and induce seepage collection/treatment of Bird Drive water through pumping seepage collection canal to L-31N. The facility will provide C-4 flood peak attenuation within the basin and provide water to L-31N available to be pumped west through the proposed S-356 A and B pumps (see Component FF3) and enhance groundwater recharge.

Operation: Inflows from western C-4 basin to be pumped into proposed recharge area to provide flood peak attenuation, groundwater recharge and to provide water to L-31N to be pumped west through the proposed S-356 A and B pumps (see Component FF). C-4 runoff in excess of 600 cfs pump capacity to be discharged eastward. Outflows will be used to meet C-4 needs when available.

The modification to this component is the seepage collection canal will be pumped down to 5.0 feet NGVD and discharged to L-31N and pumped to Northeast Shark River Slough via S-356A and B. This will make available more runoff from the Bird Drive Recharge Area.

The C-4 downstream diversion structure shall be closed in the dry season except to allow regional water to be brought in to maintain S-25B. During the wet season the structure should be opened but also allow for capture of western C-4 basin water by the reservoir and diversion of excess through the C-2 Canal.

Design:

2877 acres with a maximum depth of 4 feet.

Inflow structure: 600 cfs pump (to be resized as needed).

Outflow structure:

Water supply: Gravity structure with 200 cfs capacity at 2 feet of head.

Seepage Collection System: 500 cfs pump to control seepage collection canal at 5.0 feet NGVD. Pump to L-31N.

Location: Northwestern 4 sections in Bird Drive basin. This site was identified during the Water Preserve Area Land Suitability Analysis.

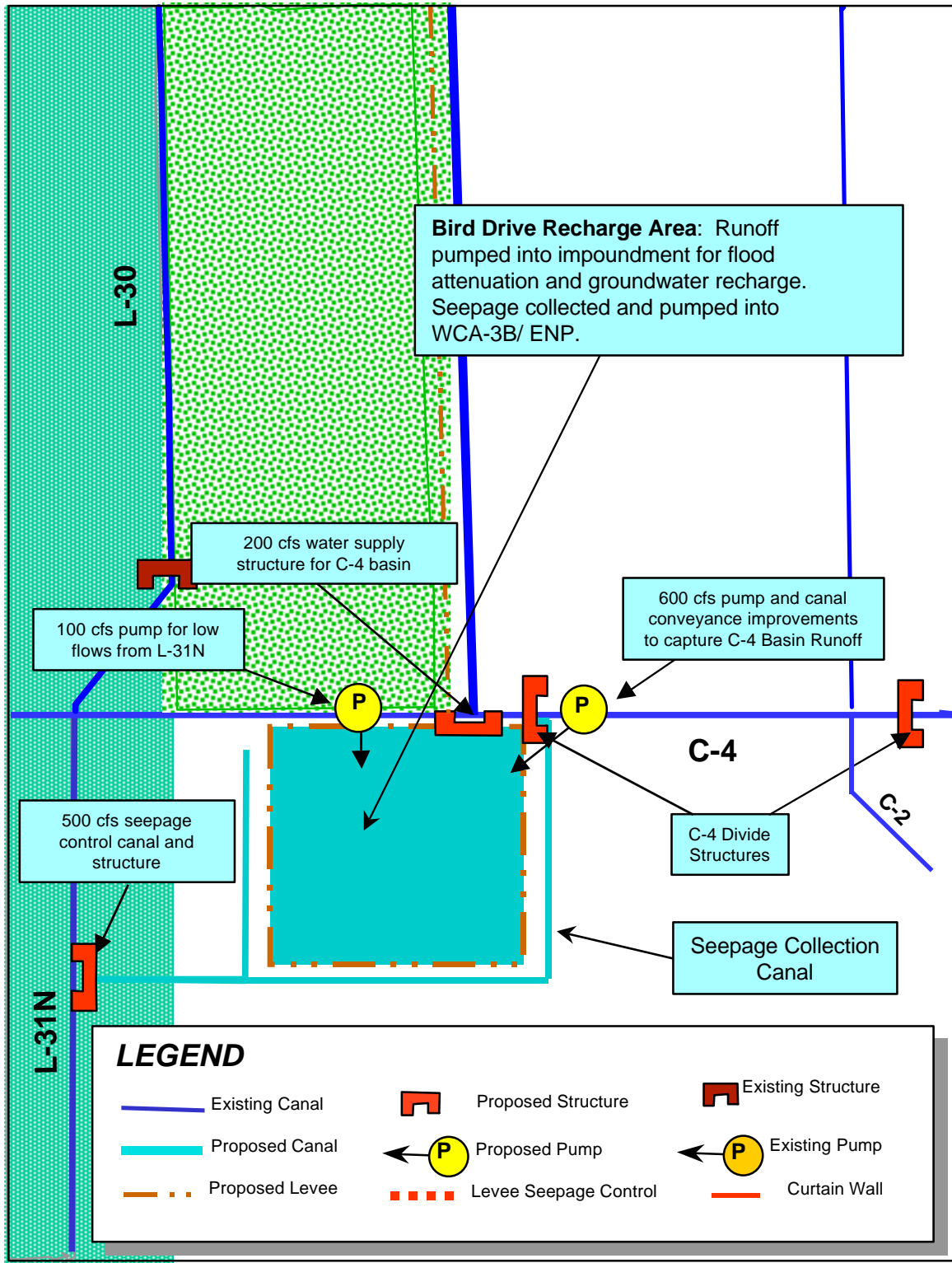
Counties: Miami-Dade

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C&SF Comprehensive Review Study – Alternative A

Assumptions and related considerations:

- 1) Treatment facility needed if seepage collected does not meet Everglades standards.



**Alternative A
Bird Drive Basin
Component Map 7**

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C&SF Comprehensive Review Study – Alternative A

Component V2

Geographic Region: Water Preserve Area – Miami-Dade County

Component Title: L-31N Levee Improvements for Seepage Management – SEE COMPONENT MAP 7

Purpose: Levee seepage management along the eastern edge (L-31N) of Everglades National Park to eliminate losses due to levee seepage to the East Coast. An additional feature has been added to reduce all wet-season seepage/ground water flows to the east. Feature will help restore hydropatterns in Everglades National Park.

Operation: 100% reduction in levee seepage flow from Everglades National Park year-round. Further 100% reduction in all groundwater flows during the wet-season. Bird Drive Recharge Area and Central Lake Belt Storage Area will be used to recharge aquifers to the east.

Design:

Levee Seepage: Sheet pile or coring material will penetrate the L-31N levee and a portion of the aquifer to retard seepage between Tamiami Trail to the 8.5 square mile area.

Wet-Season Ground Water Seepage: Distributed ground water wells adjacent to L-31N and return flows to Everglades National Park. If needed, aquifer recharge will occur from deliveries from Bird Drive Recharge Area and Central Lake Belt Storage Area.

Location: Along the existing eastern protective levee (L-31N) adjacent to Everglades National Park.

Counties: Miami-Dade

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C&SF Comprehensive Review Study – Alternative A

Component W2

Geographic Region: Taylor Creek/Nubbin Slough

Component Title: Taylor Creek/Nubbin Slough Storage and Treatment Area

Purpose: Storage reservoir to provide flood protection, water quality treatment, estuary protection and water supply benefits.

Operation: Local runoff from the Taylor Creek/Nubbin Slough basins to be pumped into a 5000-acre reservoir and then into a 5000-acre stormwater treatment area. The stormwater treatment area will reduce phosphorus concentrations in the runoff from approximately 0.528 mg/l to 0.107 mg/l. Treated water will then be pumped into Lake Okeechobee when the lake stage is falling and is at least 0.5 feet below the bottom pulse release zone.

Design:

Storage Reservoir:

5000-acres at 10 feet maximum depth

Inflow pump capacity 2500 cfs

Outflow pump capacity 1000 cfs

Stormwater Treatment Area:

5000-acres at 4 feet maximum depth

Inflow pump capacity 1000 cfs (same structure as reservoir outflow)

Outflow pump capacity 1000 cfs

Location: North of Lake Okeechobee

Counties: Okeechobee, St. Lucie

Assumptions and related considerations:

- 1) Uncertainty in land availability.
- 2) Potential increase in stage duration of Lake Okeechobee.
- 3) Potential decrease in maximum stages of Lake Okeechobee.
- 4) Phosphorus inflow concentrations (flow-weighted) for the Taylor Creek (S-191) and Nubbin Slough (S-133) Basins obtained from 5-year rolling averages (1991-1995).
- 5) Average annual discharge rates determined from the period of record 1965-1990.

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C&SF Comprehensive Review Study – Alternative A

Component X6

Geographic Region: Water Preserve Area – Palm Beach County

Component Title: C-17 Backpumping – SEE COMPONENT MAP 8

Purpose: Reduce water supply restrictions in Northern Palm Beach County Service Area by providing additional flows from the C-17 Basin to the West Palm Beach Water Catchment Area and enhance hydroperiods in the Loxahatchee Slough.

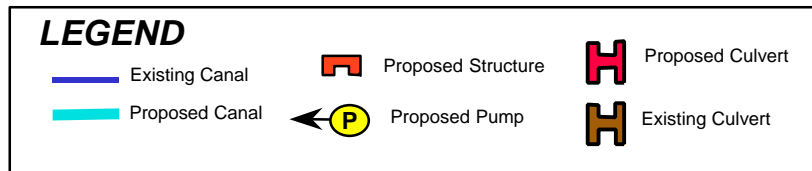
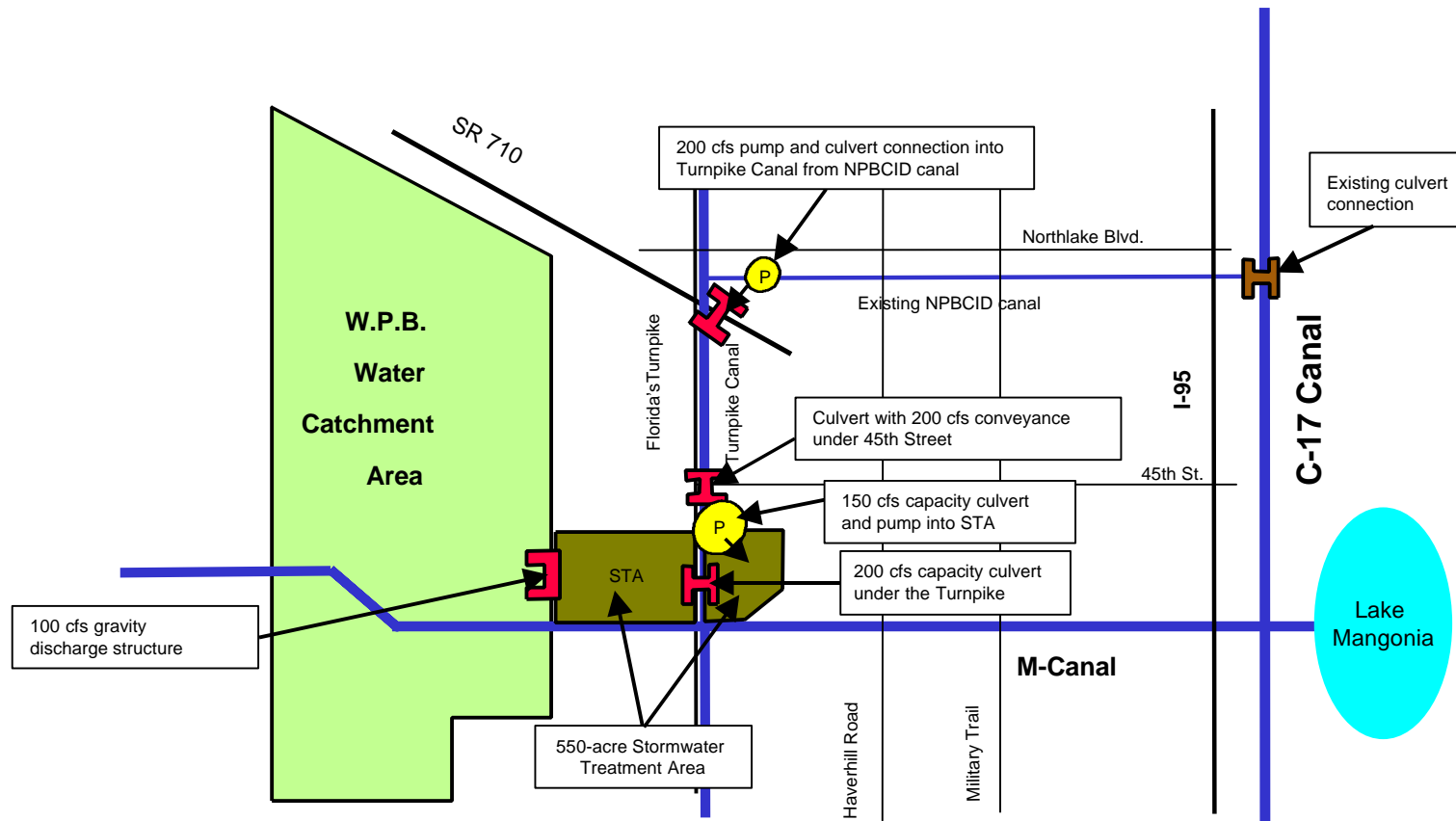
Operation: Capture excess C-17 Canal water to meet urban water supply demands in North Palm Beach Service Area. Water would be diverted through existing canals to a stormwater treatment area and ultimately to the West Palm Beach Water Catchment Area.

Design: 200 cfs pump in the existing Northern Palm Beach County Improvement District canal at its intersection with the Turnpike Canal to pull flows west and direct them south into the east Turnpike Canal.
Culvert under 45th Street (N/S) to connect the east Turnpike Canal.
150 cfs capacity culvert and pump from the Turnpike Canal to direct flows into the proposed stormwater treatment area.
550-acre stormwater treatment area at 4 feet maximum depth.
200 cfs culvert to connect stormwater treatment area under Florida's Turnpike to allow nonrestrictive flows.
100 cfs gravity discharge structure into West Palm Beach Water Catchment Area.

Location: 550 acres located east of the West Palm Beach Water Catchment Area.
Counties: Palm Beach

Assumptions and related considerations:

- 1) Water quality of C-17 water similar to C-51 water quality.
- 2) Location of stormwater treatment area south of existing landfill.
- 3) Improve conveyance in the Northern Palm Beach County Improvement District and Turnpike canals as necessary to pass flows.



Alternative A
C-17
Component Map 8

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C&SF Comprehensive Review Study – Alternative A

Component Y6

Geographic Region: Water Catchment Area – Palm Beach County

Component Title: C-51 Backpumping to Water Catchment Area – SEE
COMPONENT MAP 9

Purpose: Reduce water supply restrictions in Northern Palm Beach County Service Area by providing additional flows from the C-51 West Basin to the West Palm Beach Water Catchment Area and enhance hydroperiods in Loxahatchee Slough.

Operation: Capture excess C-51 Canal water to meet urban water supply demands in the North Palm Beach County Service Area. Water would be diverted from C-51 to a water treatment area and then into the Water Catchment Area.

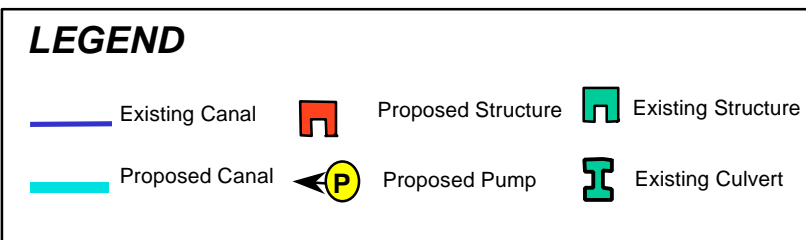
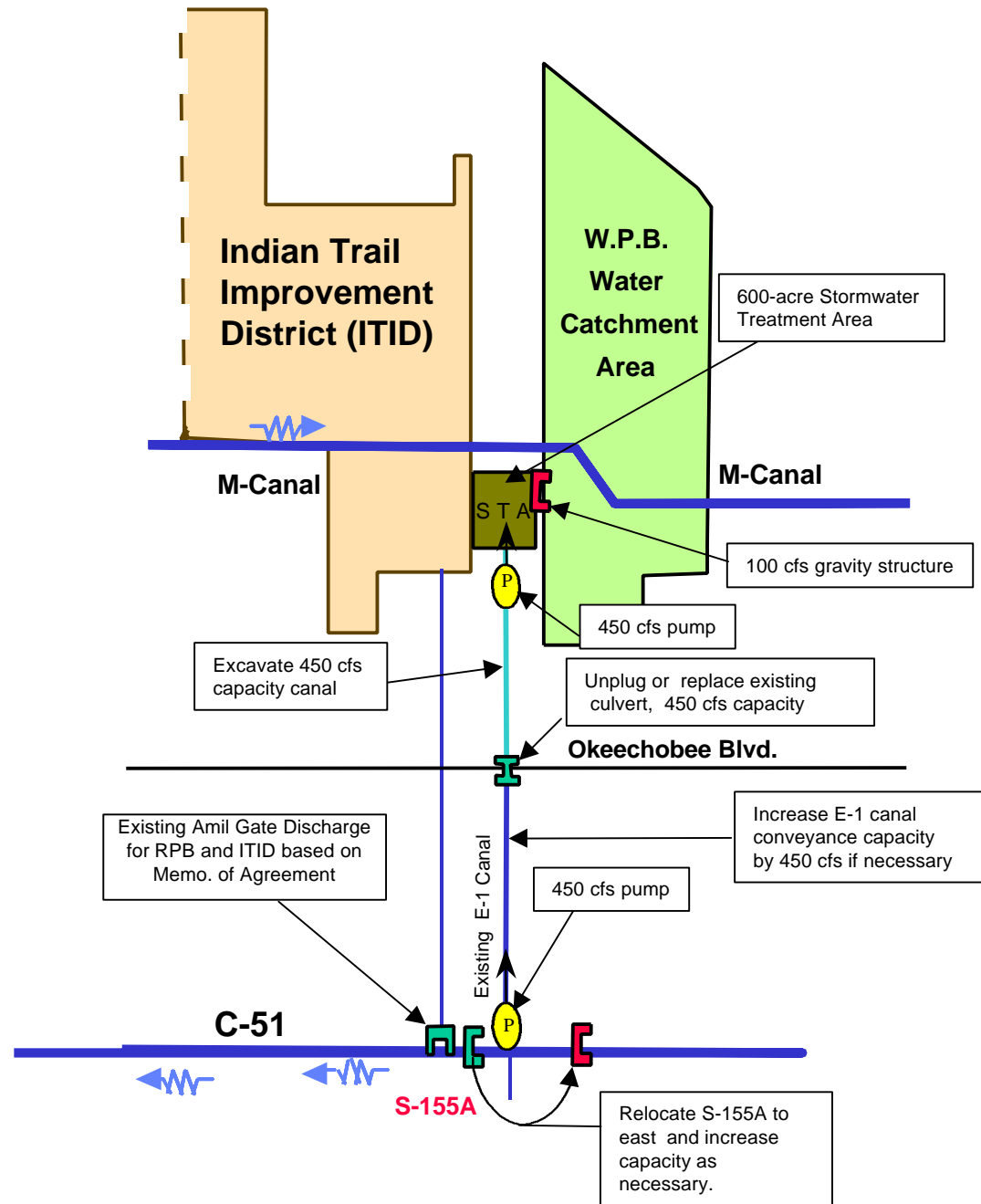
Design: 600 acres at 4 feet maximum depth to be used for stormwater treatment.
Relocate the S-155A structure east of the intersection of Lake Worth Drainage District's E-1 Canal and the C-51 Canal and increase the capacity of S-155A as necessary to pass the additional inflows.
Improve conveyance between C-51 and the stormwater treatment area as necessary.
450 cfs inflow pump to stormwater treatment area.
100 cfs gravity discharge structure into West Palm Beach Water Catchment Area.

Location: 600 acres located southwest of West Palm Beach Water Catchment Area.

Counties: Palm Beach

Assumptions and related considerations:

- 1) Uncertainty in land availability.
- 2) Connection of L-8 and C-51 Basins.



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Alternative A
C-51 East
Component Map 9

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C&SF Comprehensive Review Study – Alternative A

Component AA3

Geographic Region: Central and Southern Everglades, Water Conservation Areas and Everglades National Park

Component Title: Additional S-345 structures

Purpose: The compartmentalization of the Water Conservation Areas (WCA) has contributed to the loss of historic overland flows of the central Everglades slough system. This alteration of flows has resulted in temporal changes in hydropatterns and hydroperiods in the historic deepwater, central axis of the Shark Slough system. This component adds conveyance to WCA 3B to help in re-establishing NSM-like hydroperiods and hydropatterns in WCA 3B and Northeast Shark River Slough.

Operation: The addition of a Northeast Shark River Slough rainfall trigger well and modification of western Shark Slough basin rainfall triggers deliver additional flows to the basin. Modification of L-67A decreases downstream conveyance to the S-12's required to promote surface water flows to Water Conservation Area 3B and to Northeast Shark River Slough.

Design: Triple the total discharge capacity of S-345's to 4500 cfs and the addition of associated plugs (S-349's).

Location: The additional structures and plugs are to be spaced evenly along the southern half of L-67A.

Assumptions and related concerns: The emphasis is in re-establishing the historic persistent, deep-water slough that existed in Water Conservation Area 3B and Northeast Shark River Slough.

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C&SF Comprehensive Review Study – Alternative A

Component BB4

Geographic Region: Water Preserve Area - Palm Beach County

Component Title: Dade Broward Levee / Pennsuco Wetlands - SEE COMPONENT MAP 6

Purpose: Reduce seepage to the east from the Pennsuco wetlands and southern Water Conservation Area (WCA) 3B and enhance hydroperiods in the Pennsuco. Also an improved Dade Broward Levee will enhance recharge Miami-Dade County's Northwest Wellfield

Operation: Improvements to the Dade-Broward Levee and associated conveyance system will reduce seepage losses to the east and provide recharge to Miami-Dade County's Northwest Wellfield. Seepage reduction will enhance hydroperiods in Pennsuco wetlands and hold stage higher along southeastern WCA 3B. Recharging the conveyance features of the Dade-Broward levee from the Central Lake Belt In-ground Storage Area (see Component S3) provides recharge to Miami-Dade County's Northwest Wellfield. Treatment areas will be provided to meet all water quality standards required for release from the Central Lake Belt Storage Area if necessary.

Design:

Improve the Dade-Broward Levee:

- Construct or improve existing levee to five-foot height with two-foot top width while creating or improving existing conveyance to a capacity of up to 300 cfs.
- Provide recharge for the Dade-Broward Levee conveyance system from the Central Lake Belt Storage Area when the Conveyance Channel is below 5.0 feet NGVD at the C-4 structure located at the southern end of the Dade-Broward Levee.

Location: Dade-Broward Levee, Pennsuco Wetlands, WCA-3B, the Central Lake Belt Storage Area and Miami-Dade County's Northwest Wellfield.

Counties: Miami-Dade

Assumptions and related considerations:

- 1) Wellfield protection must be maintain through recharge of acceptable water quality.
- 2) Stormwater Treatment Area of the recharge provided from the Central Lake Belt Storage Area may be needed.
- 3) Secondary structures within the recharge canals may be needed to provide

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C&SF Comprehensive Review Study – Alternative A

seepage reduction and wellfield recharge desired.

- 4) The stage maintained in the Dade-Broward Levee conveyance is subject to change.
- 5) Telemetry systems will be required for all operable structures and pump stations.

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C&SF Comprehensive Review Study – Alternative A

Component CC6

Geographical Region: Lower East Coast

Component Title: Broward County Secondary Canal System - SEE
COMPONENT MAP 10

Purpose: Increase pump capacity of existing facilities (from the 2050 Base Case) and construct additional canal and pump facilities for the Broward Secondary Canal System to provide recharge to wellfields located in central and southern coastal Broward County, stabilize the salt water interface and reduce storm water discharges to tide.

Operation: When excess water is available in the basin, water is pumped into the coastal canal systems to maintain canal stages. When local water is not sufficient to maintain canal stages, canals are maintained first from local sources and then from Lake Okeechobee and the Water Conservation Areas. Local sources include the Site 1 Impoundment and the associated Aquifer Storage and Recovery wells (Component M).

Secondary canals maintained are 1) Broward County's C-2 from the Hillsboro Canal, 2) north secondary canal from C-13, 3) south secondary canal from C-13, 4) Turnpike canal south from C-12 and 5) canal north from C-9 at levels discussed below.

Design:

Canal Conveyance: Improve canal conveyance of secondary canal located east of the Florida Turnpike from the C-12 Canal south to the Fort Lauderdale Golf and Country Club. Alternative 5 included routing of water eastward to recharge the aquifer and help stabilize the saltwater interface at Feet Lauderdale. Canal conveyance improvements may also be necessary for the Old Plantation Water Control District's eastern canal and in southeastern Broward County.

Pump capacities and maintenance levels:

- 100 cfs pump from Hillsboro to Broward County Secondary Canal (pump #1).

- 100 cfs pump from C-13 north to Broward County Secondary Canal.

- 100 cfs pump from C-13 south to Broward County Secondary Canal (pumps #2 and #3 described in the 2050 Base Case increased from 33 cfs to 100 cfs.

- 100 cfs pump on the east Turnpike canal withdrawing water from the C-12

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C&SF Comprehensive Review Study – Alternative A

Canal (pump #4).

150 cfs pump (pump #5) on the C-9 Canal for maintaining water in southeastern Broward County.

Canal improvements and control elevations:

Improve east and west Turnpike canals and golf course lake system between C-12 and the North New River to achieve a average top width of 200 feet (see Map 10).

The Turnpike canals shall be maintained at a minimum elevation of 4.0 feet NGVD.

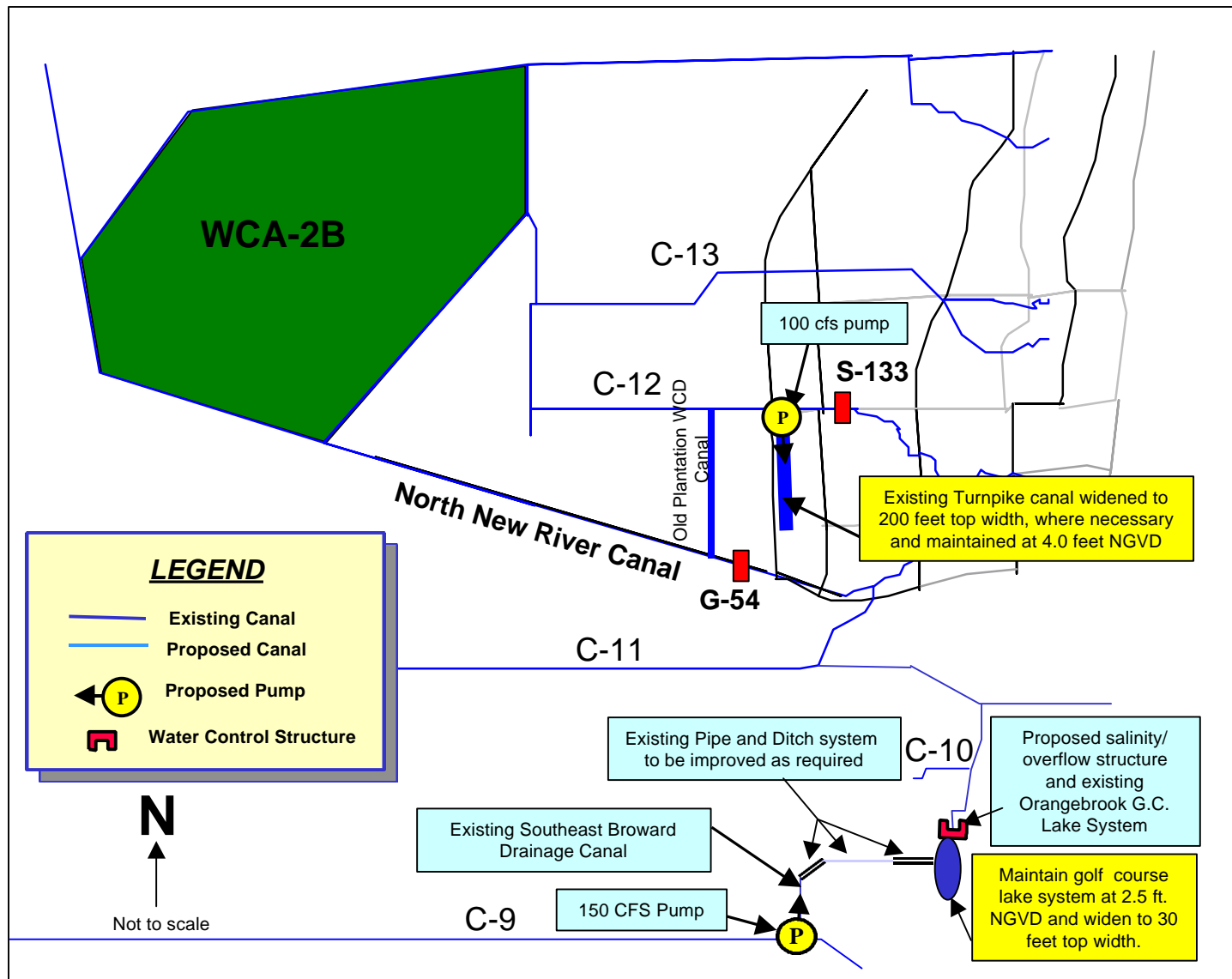
Improve canal/ lake systems in southeastern Broward County and the Orangebrook Golf Course to have an average canal top width of 30 feet.

The southeastern Broward Canal system shall be maintained at a minimum elevation of 2.5 feet NGVD.

Location: Broward County

Assumptions and related considerations:

- 1) Canal levels are maintained from local basin runoff and sources. When water is not available from local sources, water is supplied to the canal systems from the regional system.
- 2) Canal operations do not impact existing flood control levels.



Alternative A
Broward County Secondary Canal System
Component Map 10

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C&SF Comprehensive Review Study – Alternative A

Component DD5

Geographic Region: Holey Land Wildlife Management Area

Component Title: Modified Holey Land Operation Plan

Purpose: Improve timing and location of water depths within the Holey Land Wildlife Management Area based on rain-driven operations.

Operation: Rainfall-driven modified operational rules with NSM-like hydrologic conditions triggering deliveries. Rainfall-driven inflows are driven by target water depths in cell R45C18. Outflows are based on target water depths in R42C20. Alternative 5 truncates the peaks 1.5 feet above ground level and the troughs 1.0 foot below ground level.

Design: Operational change only.

Location: Southern portion of the Everglades Agricultural Area, north of Water Conservation Area 3A.

Counties: Palm Beach

Assumptions and related considerations:

- 1) Water deliveries made to the Holey Land through G-200A or from Stormwater Treatment Area 3 & 4 if Rotenberger flows are insufficient. The deliveries are assumed to be of acceptable water quality from either Rotenberger or Lake Okeechobee through Stormwater Treatment Area 3 & 4.

-Draft-
C&SF Comprehensive Review Study – Alternative A

Component EE5

Geographic Region: Rotenberger

Component Title: Modified Rotenberger Operation Plan (same as Alternative 5)

Purpose: Improve timing and location of water depths within the Rotenberger Wildlife Management Area based on rain-driven operations.

Operation: Rainfall-driven operational rules with NSM-like hydrologic conditions triggering deliveries. Rainfall-driven inflows and outflows are driven by the average of target water depths in cells R46C15 and R43C16. Alternative 5 truncates the peaks 1.5 feet above ground level and the troughs 1.0 foot below ground level.

Design: Operational change only.

Location: Southern portion of the Everglades Agricultural Area, north of Water Conservation Area 3A.

Counties: Palm Beach

Assumptions and related considerations:

- 1) Water deliveries made to Rotenberger from Stormwater Treatment Area 5 are assumed to be of acceptable water quality.

-Draft-
C&SF Comprehensive Review Study – Alternative A

Component FF3

Geographic Region: Water Preserve Area - Miami-Dade County

Component Title: Construction of S-356 A & B Structures – SEE COMPONENT MAP 11

Purpose: To improve deliveries to Northeast Shark River Slough in Everglades National Park and reduce seepage to Lower East Coast Service Area 3.

Operation: S-356 A & B begin pumping when L-31N Canal stage exceeds 6.0 feet NGVD and stops pumping when stages fall below 5.5 feet NGVD.

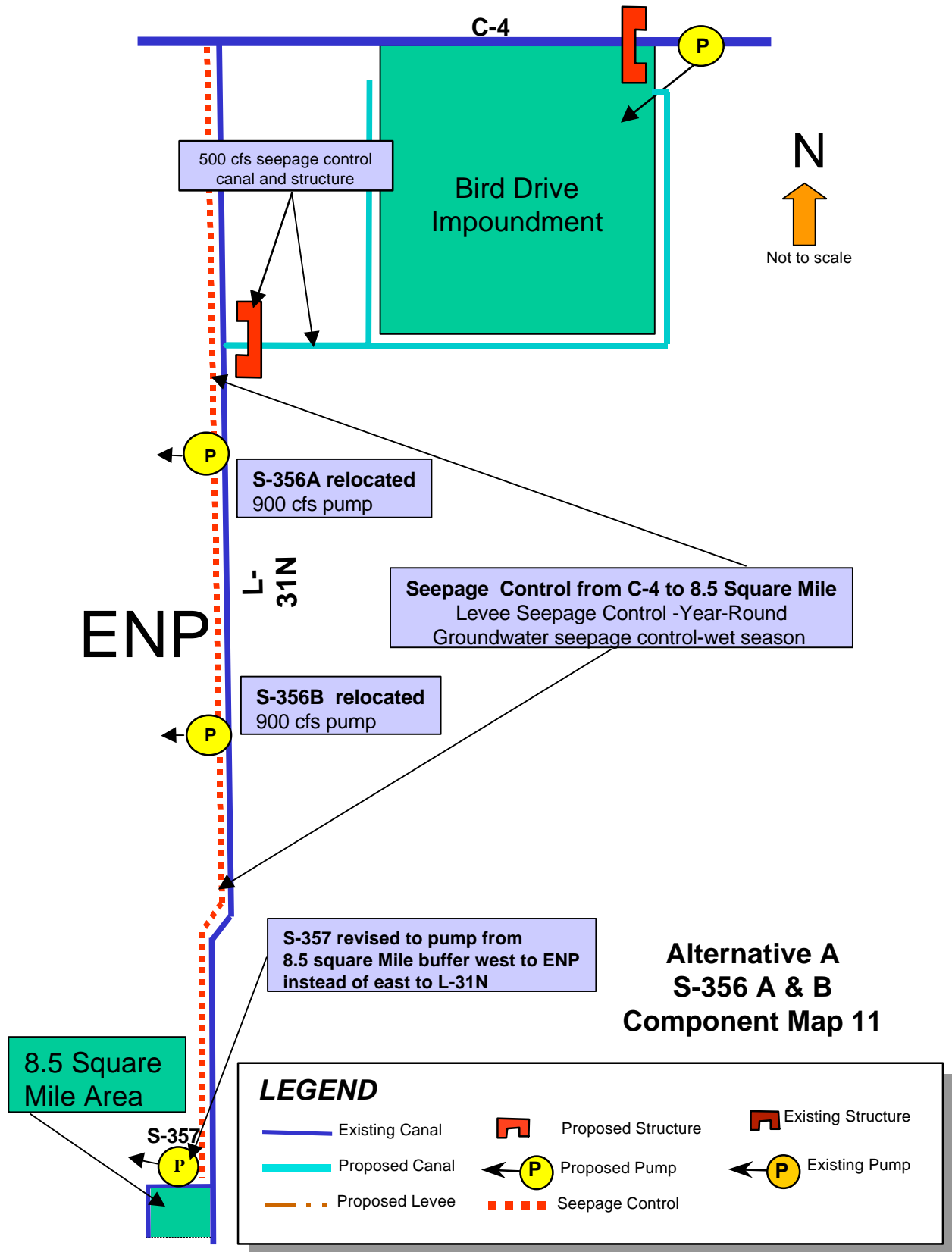
Associated Features: Redirect Bird Drive Recharge Area flow to L-31N instead of L-29. Redirect S-357 outfall from L-31N to the mid-point of the Modified Water Deliveries mitigation canal northwest of the 8.5 Square Mile Area.

Design: Remove Modified Water Deliveries S-356.
 Relocate Modified Water Deliveries S-357.
 Add S-356 A & B Structures (900 cfs each) at locations along
 L-31N between G-211 and Tamiami Trail.

Location: L-31N along east side of Northeast Shark River Slough
 Counties: Miami-Dade

Assumptions and related considerations:

- 1) Water Quality is not a problem.
- 2) Bird Drive Recharge Area flows are redirected seepage.
- 3) No adverse impacts to areas east of L-31N.
- 4) S-356 A & B to be resized (reduced) as needed. Initially assumed large to not constrain performance.



-Draft-
C&SF Comprehensive Review Study – Alternative A

Component GG4

Geographic Region: Lake Okeechobee

Component Title: Lake Okeechobee Aquifer Storage and Recovery (Lake ASR)
– SEE COMPONENT FIGURE 1.

Purpose: Provides additional regional storage while reducing both evapotranspiration losses and the amount of land removed from current land use (e.g. agriculture) that would normally be associated with construction and operation of above-ground storage facilities (reservoirs);
 Increase the Lake's water storage capability to better meet regional water supply demands for agriculture, Lower East Coast urban areas, and the Everglades;
 Manage a portion of regulatory releases from the Lake primarily to improve Everglades hydropatterns, meet environmental targets within the Water Conservation Areas (WCAs), and meet supplemental water supply demands of the Lower East Coast;
 Reduce harmful regulatory discharges to the St. Lucie and Caloosahatchee estuaries;
 Maintain existing level of flood protection.

Operation: Water from Lake Okeechobee is to be pumped into the Lake Aquifer Storage and Recovery (ASR) wells when the climate-based inflow forecast projects that the Lake water level will rise significantly above those levels that are desirable for the Lake littoral zone (15.25 - 14.85 feet NGVD; Figure 1). During the dry season, flow may be made back to the Lake from the ASR wells either when the Lake water level is projected to fall to within three-quarters of a foot of the supply-side management line the same dry season, or below 11.75 feet NGVD the upcoming wet season. During the wet season, flow is allowed from the ASR wells to the Lake when climate-based inflow forecast projects less than 1.5 million acre-feet of inflow during the next 6 months, and the Lake water level is either below 11.75 feet (NGVD) during the current wet season, or is projected to be in supply-side management during the upcoming dry season.

Design: 1000 MGD total: 200, 5-MGD ASR wells and associated infrastructure

Location: Lake Okeechobee peripheral levee

-Draft-

C&SF Comprehensive Review Study – Alternative A

Assumptions and Related Considerations:

- 1) Current United States Environmental Protection Agency and Florida Department of Environmental Protection regulations require that ASR source water meet primary drinking water standards before injection. Lake Okeechobee water is assumed to meet these standards.
- 2) ASRs will have an approximate recovery rate of 70%, i.e. 30% of water injected to the deep wells is lost due to transmission (injection and recovery) and storage (mixing with deep aquifer saline water, migration of ASR storage flume) losses.

-Draft-
C&SF Comprehensive Review Study – Alternative A

Component HH3

Geographic Region: Central and Southern Everglades, Water Conservation Areas and Everglades National Park

Component Title: Operation Change of S-343 A and B

Purpose: Releases from the southwest corner of Water Conservation Area 3A contributes to the flow in a nesting region of the Cape Sable Sparrow. In order to reduce the potential adverse effects on the nesting season, the S-343 A and B structures will be closed during the January to June time period.

Operation: The new schedule will include releases to achieve NSM water depths except during the months of January to June when the releases are suspended. The suspension of releases will help provide a recession of downstream stages during the nesting season.

Design: No change.

Location: No change.

Assumptions and related concerns:

- 1) ATLSS outputs from Alternative 2 indicated an adverse condition related to increased flows to the western side of the ENP. Although the operational change should improve the conditions for the Cape Sable Sparrow, less flow will be sent to the Lostmans Slough area.

-Draft-
C&SF Comprehensive Review Study – Alternative A

Component II3

Geographic Region: Everglades Agricultural Area (EAA) - Palm Beach County

Component Title: Pump Station G-404 Modification

Purpose: Increase the capacity of proposed Everglades Construction Project (ECP) pump station G-404 to improve the hydropattern restoration in the northwest corner of Water Conservation Area 3A (WCA 3A) and increase the amount of water available in the west-central region of WCA 3A to reduce dry out periods.

Operation: Pump the maximum Stormwater Treatment Area (STA) 3/4 treated discharge possible across the Miami Canal from the L-5 borrow canal to the L-4 borrow canal to the northwest corner of WCA 3A. The treated discharge will sheet flow across the northern reach of WCA 3A between the Miami Canal and L-28 and flow down the L-28 canal through structure S-140. This additional water should improve the hydropattern restoration and reduce the number of dry out periods in the central region of WCA 3A. This diversion of water from the northeast section of WCA 3A should reduce the inundation duration and extreme high water depths in this sector of the water conservation area.

Design:

Increase the capacity from 1000 cfs to 2000 cfs on this proposed vertical, axial flow, low head, high capacity pump station (may be slightly resized after further hydraulic analyses).

Location: Confluence of Miami Canal, L-5 Borrow Canal and the L-4 Borrow Canal north of the S-8 Pump Station.

Counties: Palm Beach

Assumptions and related considerations:

- 1) Land Availability.
- 2) Compatibility with proposed G-404 design.
- 3) Modifications to the L-4 and L-5 borrow canals if needed to increase the conveyance capacities to handle the additional conveyance.

-Draft-

C&SF Comprehensive Review Study – Alternative A

Component JJ3

(not included in this Alternative)

-Draft-
C&SF Comprehensive Review Study – Alternative A

Component KK4

Geographic Region: Water Conservation Area 1

Component Title: Loxahatchee National Wildlife Refuge Internal Canal Structures

Purpose: Improve timing and location of water depths in the Refuge.

Operation: Structures would remain closed except to pass Stormwater Treatment Area (STA) 1 East and STA – 1 West outflow and water supply deliveries.

Design:

- (1) L-7 borrow canal structure: 1500 cfs gravity structure at 0.5 feet of head.
- (2) L-40 borrow canal structure: 1500 cfs gravity structure at 0.5 feet of head.

Location: The L-7 structure is located at cell R28C50 in the L-7 borrow canal within the Loxahatchee National Wildlife Refuge. The L-40 structure is located at cell R34C50 in the L-40 borrow canal within the refuge.

Counties: Palm Beach

Assumptions and related considerations:

- 1) STA discharges to the Loxahatchee National Wildlife Refuge are assumed to be of acceptable water quality.

-Draft-
C&SF Comprehensive Review Study – Alternative A

Component LL3

Geographic Region: Lower East Coast Service Area 1

Component Title: C-51 Regional Groundwater Aquifer Storage and Recovery (ASR)

Purpose: This is a regional groundwater aquifer storage and recovery system which will capture and store excess water during wet periods and recover the water for utilization during dry periods. Use of the recovered water during dry periods will make more local water available and reduce the need for regional system water.

Operation: Water will be captured and stored when water is being discharged out of S-155 to tide. Water will be recovered during dry periods based on canal elevations. Recoverable water is limited to 70 % of injected water.

Design: This component consists of 34 well clusters located along the West Palm Beach Canal, each being composed of two (2) surficial aquifer wells and one Upper Floridan aquifer ASR well. The surficial aquifer wells will each have a 2.5 MGD withdrawal capacity and be located in proximity to the canal so that the water withdrawn would result in the interception of water that would otherwise go to tide in wet periods. Each upper Floridan aquifer ASR well will have a capacity of 5 MGD. (The total injection and recovery capacity of the ASR system is 170 MGD.) Water will be injected when stages in the C-51 Canal are above 8.0 feet NGVD. Water will be retrieved from the ASR wells when canal stages are below 7.8 feet NGVD. Recovered water will be discharged to the C-51 Canal.

Location: Along the C-51 Canal in Eastern Palm Beach County east of U.S. Route 441.

Counties: Palm Beach

Assumptions and Considerations:

- 1) It is assumed that groundwater ASR in proximity to the C-51 canal is permissible without treatment.

-Draft-
C&SF Comprehensive Review Study – Alternative A

Component MM4

Geographic Region: Lower East Coast Service Area 1

Component Title: Hillsboro Canal Basin Regional Groundwater Aquifer Storage and Recovery (ASR)

Purpose: This is a regional groundwater aquifer storage and recovery system which will capture and store excess water during wet periods and recover the water for utilization during dry periods. The ability to use the recovered water during dry periods will increase regional water resources.

Operation: Water will be captured and stored when water is being discharged from the coastal Hillsboro Canal basin to tide. Water will be recovered during dry periods based on canal elevations. Recoverable water is limited to 70% of injected water.

Design: This component consists of 22 well clusters located along Hillsboro Canal, each being composed of two (2) surficial aquifer wells and one Upper Floridan aquifer ASR well. The surficial aquifer wells will each have a 2.5 MGD withdrawal capacity and be located in proximity to the canal so that the water withdrawn would result in the interception of water that would otherwise go to tide in wet periods. Each upper Floridan aquifer ASR well will have a capacity of 5 MGD. (The total injection and recovery capacity of the ASR system is 110 MGD.) Water will be injected when stages in the Hillsboro Canal are above 7.1 feet NGVD to 22 wells. When water is available from the Site 1 Reservoir (see Component M) it will be supplied for injection to the remaining 15 wells. Water will be retrieved from the ASR wells when canal stages are below 7.0 feet NGVD. Recovered water will be discharged to the Hillsboro Canal.

Location: Along the coastal reach of the Hillsboro Canal in Palm Beach and Broward Counties

Counties: Palm Beach, Broward

Assumptions and Considerations:

- 1) It is assumed that groundwater ASR in proximity to the Hillsboro Canal is permissible without treatment.

-Draft-

C&SF Comprehensive Review Study – Alternative A

Component NN3

(not included in this Alternative)

-Draft-
C&SF Comprehensive Review Study – Alternative A

Component OO4

Geographic Region: South Miami-Dade County

Component Title: Modification to South Dade in Southern Portion of L-31N and C-111

Purpose: To improve deliveries to Everglades National Park and decrease potential flood risk in the Lower East Coast service area.

Operation: Modify C-111 Canal operations.

Location: South Dade Conveyance System
Counties: Miami-Dade

Assumptions and related considerations:

- 1) Will not cause adverse impacts to ENP and South Dade Agricultural Lands.
- 2) This component is dependent on Component FF.

-Draft-
C&SF Comprehensive Review Study – Alternative A

Component PP3

Geographic Region: North Miami-Dade County

Component Title: Backpumping of the C-7 Basin to the Central Lake Belt Storage System via the C-6 Canal.

Purpose: To capture a portion of wet season flows from the C-7 basin to tide through backpumping runoff from the basin to the Central Lake Belt Storage Area and to decrease flooding problems in the C-7 basin.

Operation: Reduce flood flows to tide through pumping runoff from the C-7 Canal west to the C-6 Canal at G-72. This excess water can then be pumped to the Lake Belt Storage Area along with C-6 basin runoff that is proposed to be backpumped in component S. The pump from the C-7 Canal should be operated when S-27 structure is above 2.0 feet NGVD. C-6 pump should be operated to backpump to the Central Lake Belt Storage Area as per the previous component S design and additionally when the C-7 pump is operated.

Design: 300 cfs pump from C-7 Canal at G-72 to C-6 Canal.
Increase C-6 pump from 300 cfs to 600 cfs.

Location: C-7, C-6, and Central Lake Belt Storage Area
Counties: Miami-Dade

Assumptions and related considerations:

- 1) All water quality considerations will be addressed regarding backpumping C-6 and C-7 basins to the Central Lake Belt Storage Area to be used for water supply.
- 2) This component is dependent on component S.
- 3) Dry Season water supply will continue to maintain S-27 without change.

-Draft-

C&SF Comprehensive Review Study – Alternative A

Component QQ

(not included in this Alternative)

-Draft-

C&SF Comprehensive Review Study – Alternative A

Component RR

(not included in this Alternative)

-Draft-

C&SF Comprehensive Review Study – Alternative A

Component SS

(not included in this Alternative)

-Draft-

C&SF Comprehensive Review Study – Alternative A

Component TT

(not included in this Alternative)

-Draft-
C&SF Comprehensive Review Study – Alternative A

Component UU6

Geographic Region: St. Lucie River Estuary/C-23, C-24, Northfork and Southfork Basins

Component Title: Storage Reservoirs

Purpose: Storage reservoirs to capture local runoff from the C-23, 24, and Northfork and Southfork Basins of the St. Lucie River Estuary. The reservoirs will be designed for flood flow attenuation to the estuary, water supply benefits including environmental water supply deliveries to the estuary, and water quality benefits to reduce salinity and nutrient impacts of runoff to the estuary. There is one reservoir in each basin.

Operation:

Inflows from C-23, C-24 and Northfork and Southfork of the St. Lucie River.

Design:

A total of 20,200 acres at 8 feet maximum depth distributed as follows among these basins: C-23 – 6500 acres, C-24 – 4600 acres, Northfork – 9100 acres. In the Southfork Basin storage requirements were met using 15,000 acres inundated to a depth of 2 feet.

Inflow pump capacity = 1.5 inches per day

Outflow structure capacity = TBD (initially assumed to not constrain performance)

Location: To be determined – Specific site not necessary for Water Management Model simulation.

Counties: Martin and St. Lucie

Assumptions and related considerations:

- 1) Uncertainty in land availability.
- 2) Potential water quality benefits by reducing nutrient and sediment loading to the estuary.

-Draft-

C&SF Comprehensive Review Study – Alternative A

Component VV

(not included in this Alternative)

-Draft-

C&SF Comprehensive Review Study – Alternative A

Component WW

(not included in this Alternative)

-Draft-

C&SF Comprehensive Review Study – Alternative A

Component XX

(not included in this Alternative)

-Draft-

C&SF Comprehensive Review Study – Alternative A

Component YY

(not included in this Alternative)

-Draft-

C&SF Comprehensive Review Study – Alternative A

Component ZZ

(not included in this Alternative)

-Draft-

C&SF Comprehensive Review Study – Alternative A

Component AAA

(not included in this Alternative)

-Draft-

C&SF Comprehensive Review Study – Alternative A

Component BBB

(not included in this Alternative)

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C&SF Comprehensive Review Study – Alternative A

Component CCC

(not included in this Alternative)

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C&SF Comprehensive Review Study – Alternative A

Component DDD5

Geographic Region: Caloosahatchee/C-43 Basin

Component Title: Caloosahatchee Backpumping with Stormwater Treatment Area (STA)

Purpose: Capture excess C-43 basin runoff to augment the regional system. These facilities will be designed to backpump excess water from C-43 to Lake Okeechobee after treatment through an STA.

Operation: This component operates after Estuary and Agricultural/Urban demands have been met in the C-43 basin and when water levels in the C-43 storage reservoir (Component D5) exceed 6.5 feet. When this situation occurs, water will be released from the reservoir and delivered to the STA at the capacity of the backpumping/treatment system (2000 cfs). The STA water is then backpumped to Lake Okeechobee. An additional requirement for the backpumping to take place is that Lake Okeechobee must be considered to have storage capacity available, i.e. when its levels are below the pulse release zone line shown on Figure 1.

Design: The key components in the design are pumps and a stormwater treatment area. For the design it has been assumed that the STA is located adjacent to Lake Okeechobee. Because it is not known where the reservoir will be located relative to the STA, it has been assumed that water to be delivered to the STA will be released from the reservoir to the Caloosahatchee River and then pumped from the River into the STA. Since no pump to bring water from the lower Basin (below S-78) to the upper basin has been included in the reservoir design and since most of the basin runoff is generated in the lower basin, a pump to bring the water from the lower Caloosahatchee basin to the upper basin has also been included. The STA has been included to meet the anticipated need to improve the quality of the water before it enters Lake Okeechobee. Finally, a pump station will be used to lift the water from the STA to Lake Okeechobee.

Pumps: 1 pump of 2000 cfs capacity to take water from the lower Caloosahatchee Basin to the upper Caloosahatchee Basin; 1 pump of 2000 cfs capacity to take water from the Caloosahatchee River into the STA; and 1 pump of 2000 cfs capacity to discharge water from the STA to Lake Okeechobee.

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C&SF Comprehensive Review Study – Alternative A

STA: an STA of approximately 5000 acres is proposed to achieve water quality improvements.

Location(s) TBD - Specific site not necessary for simulations.

Counties: Hendry, Glades

Assumptions and related considerations:

- 1) Uncertainty in land availability.
- 2) Water quality benefits to the Lake.
- 3) The Franklin Lock and Dam S-79 time series flow demand for the Caloosahatchee Estuary has been reduced. The Performance Measures were not changed.
- 4) The model assumes that the backpumping/treatment facility, primarily the STA, functions as a flow-through system.

-Draft-

C&SF Comprehensive Review Study – Alternative A

Component EEE

(not included in this Alternative)

-Draft-

C&SF Comprehensive Review Study – Alternative A

Component FFF

(not included in this Alternative)

-Draft-

C&SF Comprehensive Review Study – Alternative A

Component GGG

(not included in this Alternative)

-Draft-

C&SF Comprehensive Review Study – Alternative A

Component HHH

(not included in this Alternative)